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UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 654

OFFICE OF THE SECRETARY

Contribution from the Office of Farm Management
W. J. SPILLMAN, Chief

Washington, D. C. ▼ June 14, 1918

FARM ORGANIZATION IN THE IRRIGATED VALLEYS OF SOUTHERN ARIZONA

By

R. W. CLOTHIER, Agriculturist

CONTENTS

	Page
Object of Investigations	1
Summary of Results	1
General Description of Localities	4
Method of Investigation	15
Standards Used in this Bulletin for Measuring Success	17
Types of Farming	21
The Adaptation of the Farm Enterprises to the Size of the Farm	42
The Relation of Capital Invested and Size of Farm to Farm Income and Labor Income	47

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	Page.		Page.
Object of investigations	1	Types of farming	21
Summary of results	1	The adaptation of the farm enterprises to the size of the farm	42
General description of localities	4	The relation of capital invested and size of farm to farm income and labor income	47
Method of investigation	15		
Standards used in this bulletin for measuring success	17		

OBJECT OF INVESTIGATIONS.

This bulletin presents the results of a farm survey of 627 farms conducted in the three larger irrigated valleys in southern Arizona. The general object of the investigations was to determine those factors of business management and farm practice which influence financial returns and lead to success or failure, in order that recommendations might be made that would lead to general financial improvement among all farmers in the districts studied. The valleys are located as follows (see fig. 1): Salt River Valley, in the southeastern part of Maricopa County; Gila Valley in Graham County northeast of the Pinolenos Range of mountains; and Yuma Valley, in Yuma County, in the southwest corner of the State.

SUMMARY OF RESULTS.

The facts brought out by this study indicate that the selection of farm enterprises is of great importance and should be carefully studied both by new and old settlers. Over 25 per cent of the farms in the three valleys failed to pay current interest rates on investment, owing largely to a farm organization based primarily on relatively unprofitable enterprises.

Dairying was found to be the most stable as well as the most popular enterprise in the three valleys, contributing 67.7 per cent of the

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total receipts on 178 farms out of a total of 627, and contributing 24.9 per cent of the total receipts of all the farms studied. It is also one of the most profitable enterprises, both farm income and farmer's wages rising with the percentage of receipts from dairying. Dairying can be made more profitable by improving the system of pasturing and keeping up the thrift of the alfalfa fields; also by improving the dairy herds.

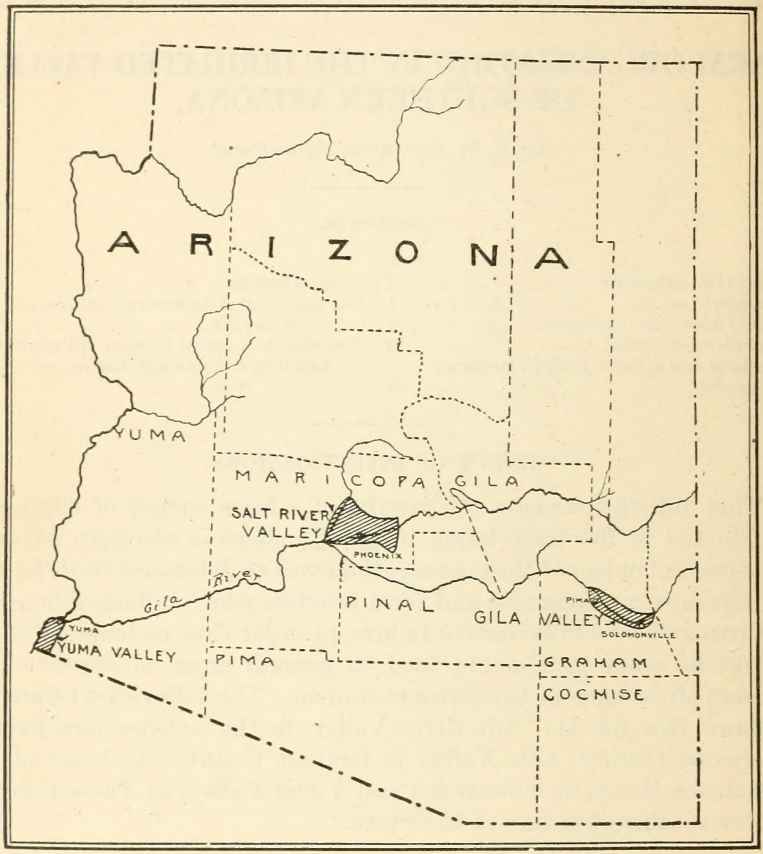

FIG. 1.—Map of Arizona, showing location of regions studied (shaded areas).

Growing alfalfa for hay ranked next in popularity to dairying, when judged by the number of farmers engaged in it, but it was not so profitable except with maximum yields, which must approach 7 tons per acre, and at prices approaching $10 per ton. Both farm income and farmer's wages decrease as the percentage of receipts from hay increases.

The production of alfalfa seed for the market is highly profitable in Yuma Valley, but the enterprise has not been developed in the other two valleys.

The sale of pasture is an important side line to hay farming, but when made a major enterprise is not as profitable as hay farming.

Fattening beef cattle for the market is a popular and profitable enterprise on the larger farms.

The enterprises that do not depend upon alfalfa for their existence are cotton farming, grain farming, fruit farming, poultry farming, and trucking and gardening.

Cotton farming is a new enterprise, based on an acclimatized variety of Egyptian cotton which promises to be a profitable rotation crop with alfalfa.

Grain farming is relatively profitable only on the cheaper lands. Poultry raising is a profitable enterprise, especially on the small farms, and is an important side line on farms of all sizes.

Fruit farming is relatively profitable on the small farms, though fruit lands are so highly valued that they often fail to pay current interest rates on their valuation. They furnish a relatively high standard of living and a relatively low standard of wages to the farmer.

Trucking and gardening are unpopular, and are believed by most of the farmers in the districts to be unprofitable. Cantaloupes are highly speculative, sometimes returning high profits and sometimes failing to pay freight bills on shipments.

Diversified farming when based on dairying or poultry is relatively more profitable than hay farming, but not as profitable as dairying. It has made its best development on farms of medium size where dairying and poultry are strongly emphasized among the diversified enterprises.

Some adaptation of type to size of farm is necessary; poultry raising, dairying, and fruit farming being required on small farms, dairying being adapted to the farms of medium size, and the beef-cattle enterprise giving the best returns on the larger farms.

The amount of capital required varies with the size of the farm and the enterprises to be selected. The farm income and labor income rise almost directly with increase in capital invested.

Farmers with little means find it more profitable to rent than to buy land, and the renter makes relatively much more for his labor, which is his chief asset, than the owner farmer. This is due to a low-renting value of land compared with its commercial value, landlords making an average of 4.87 per cent net on the valuation of their lands.

Here, as in most other farming regions, the size of the farm has a direct bearing upon the standard of living afforded the operator, and also upon the wages he receives for his labor. There is a constant and steady rise in both labor income and farm income as the average size of the farms rises from 11 acres in the smallest-size group to 530

acres in the largest-size group, and there is no indication that still larger farms would not continue to pay still larger labor incomes.

Here, as elsewhere, the minimum farm unit should be large enough to afford the farm family at least a comfortable living, with some margin for savings. Whether it should be large enough to pay "reasonable wages" for the farmer's labor is a matter to be decided by the individual concerned. The personal ability of the operator and the means at his command are factors that must be considered.

Small farms are more intensively farmed than large ones, but the large farms give better returns for a given amount of labor. One man manages eight times as many acres, five times as many live stock, and three times as much capital on the very large farms as on the very small farms; and this more than compensates for the greater returns per acre on the small farms. However, increasing receipts per acre pays on large farms, the farm income and labor income both rising as receipts per acre increase, even though the average area farmed decreases.

Of a total of 627 farmers, 466 managed their farms so as to make them pay an average of 13 per cent on the investment in addition to the farm contribution to the family living, while 161 farmers were able to make their farms pay but 5.9 per cent on the investment, the labor of the farmer himself not being included in expenses in either case. This difference was due almost entirely to differences in gross receipts obtained by the two groups of farmers.

It was found that gross receipts are influenced by the type of farming, the amount of working capital per acre, the number of acres farmed per man, the productivity of the land, and the quality of the live stock. All of these factors are largely within the control of the Arizona farmer.

GENERAL DESCRIPTION OF LOCALITIES.

SALT RIVER VALLEY.

Salt River Valley is the largest of the three valleys studied. It extends from the junction of the Verde River with Salt River to the junction of the Salt with the Gila River, a distance of about 50 miles. Its average width is approximately 20 miles. It contains somewhat over 200,000 acres of irrigated lands, about three-fifths of which are on the north side of the river.

The soils, being of alluvial origin, are deep, and vary in texture from light sands to heavy clays, or "adobe." They are fully described and mapped in a bulletin[1] issued by the Bureau of Soils of the United States Department of Agriculture.

The climate may be classified as subtropical. There is a long, hot summer and a short, mild winter. The heat in summer is greatly

[1] A Soil Survey in Salt River Valley, Ariz.

mitigated by a very dry atmosphere, and sunstroke is unknown. The nights are always cool, a range of 50° between day and night temperatures being not uncommon during the summer months. The following table shows the highest, lowest, and mean temperatures for each of the months during 21 years at Phoenix, which is approximately the center of the irrigated section:

TABLE I.—*Temperature data at Phoenix, Ariz. for 21 years, 1896 to 1916, inclusive.*[a]

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.	° F.
Highest	81	91	94	102	114	116	117	113	112	100	92	80
Lowest	16	24	31	37	39	49	63	62	49	41	28	22
Mean	50.0	54.4	60.5	66.6	74.8	84.8	90.4	89.0	81.4	70.2	58.7	51.9

[a] U. S. D. A. Weather Bureau, Summary of Climatological Data for the United States by sections. Section III, and later annual reports.

The rainfall averages about 7.27 inches per year. Most of the precipitation occurs during two short rainy seasons, one in July and August and the other during the winter months. The summer rains are entirely local in origin and character, while the winter rains are of a more general nature. The rains are seldom copious enough to take the place of irrigation, and crop production depends entirely upon irrigation for its water supply.

There is abundant evidence that this valley was once irrigated by ancient peoples, probably the ancestors of the semicivilized tribes of Indians now living in or near the valley. Old canals aggregating 150 miles in length have been located and it is estimated that at least 140,000 acres were under cultivation at that time. Much of the adobe and other heavy surface soils now found at different places in the valley probably were deposited from muddy water used for irrigation.

The modern development of the valley began in 1867 with the construction of the Swilling Canal. Between this date and 1892 a dozen or more canals were constructed which were about equally distributed between the north and the south sides of the river. With but few exceptions the dams and headgates for these canals were of a temporary nature and were washed out with every flood. The dam for the Arizona Canal (see fig. 2), the largest one in the valley, was the only one which had any semblance of permanency, and it was partly washed out in 1891 and completely destroyed by the floods of 1905. These conditions resulted in chronic water famine. When the river was full of water there were no dams to divert it to the land, and when there were dams in the river there was not enough water to irrigate all the lands under the canals. Water rights for 151,360 acres of land were adjudicated in 1889,

but the census of 1890 reported only 327 irrigators in the valley and only 35,212 acres under cultivation.

The development of agriculture under such conditions was fitful and uncertain. The raising of hay, grain, and live stock became the leading enterprises. Several corporations were organized for the development of the fruit industry on a large scale but all resulted in failure, and only a few of the remnants of such efforts now remain in the valley. A few citrus, olive, and almond orchards survived the vicissitudes of the times, and these are now producing profitable crops, although frosts in recent years have interfered materially with the extension and success of the citrus industry.

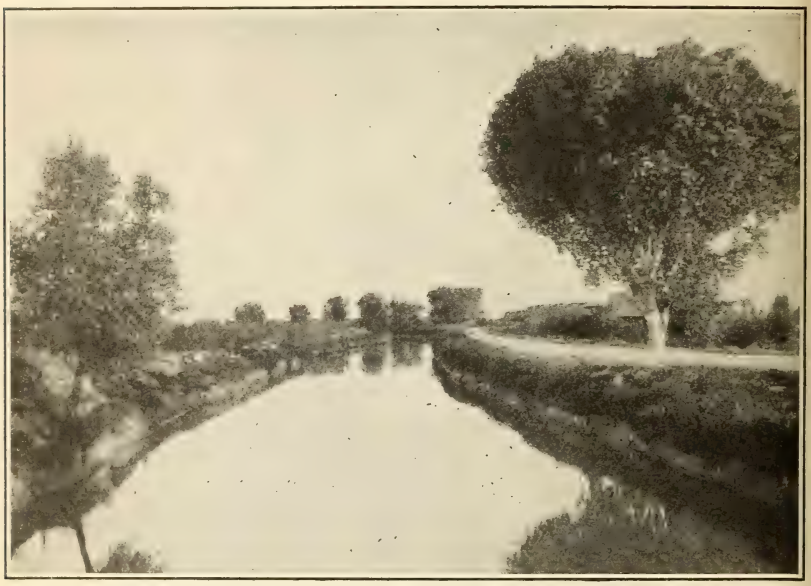

FIG. 2.—The Arizona Canal, Salt River Valley.

An attempt to manage the water supply more successfully was made in 1898, when all the canals on the north side of the river were organized under one corporation, known as the Arizona Water Co. These canals were operated by this company until 1903, when all the canals in the valley, except the Tempe Canal, and perhaps one or two small ditches, were brought under one control by the organization of a corporation known as the Arizona Water User's Association, into whose membership were brought all the water users supplied by these canals. This corporation then entered into contract with the United States Government for the development of water and its delivery to the lands controlled by the association.

A reclamation project for the valley was authorized March 12, 1903, and the construction of the Roosevelt Dam at the junction of

Tonto Creek with the Salt River was begun. Water rights were again adjudicated and the lands of the valley were divided into three classes based on priority of water right. Lands in class A have prior rights to a certain amount of water known as the "normal flow" of the river, and in addition have an equal right in water that may be stored in the reservoir. Class B lands have prior rights to a certain amount of flood water, in other words, a certain amount of the flow of the river which is above the normal flow, and in addition have equal rights in stored water. Class C lands have any flood waters not appropriated to class B lands, and in addition equal rights with all lands in stored water. These rights may be stated more briefly by saying that all lands have equal rights in water stored in the reservoir, but in addition Class A lands are entitled to all the normal flow of the river, and when the river flow is at a flood stage the flood water goes to lands in classes B and C. In addition to these general differences in water rights, there are differences in priority of right among the lands in each of the three different classes. When there is a good normal flow in the river, lands in class A may be abundantly supplied from that source and may save their stored water until the end of the season, or until the normal flow drops so low that they are compelled to draw upon it, while lands in classes B and C may be compelled to rely upon stored water during the whole season. Any stored water remaining unused at the end of the season reverts to the general fund, and is reapportioned equally among all water users at the beginning of the next year.

The Roosevelt Dam was completed in 1912 and stored water delivered for the first time during that year. The reservoir was not over half full at this time, and during the season of 1914 the supply of water had run so low that several thousand acres of land in classes A and B did not receive sufficient water to meet the requirements of the crops upon them. Considerable loss to the owners resulted. In April, 1915, the reservoir was filled for the first time, and water ran over the spillway. It overflowed again early in 1916. Careful estimates based upon a long series of annual measurements of the river flow indicate that with the reservoir full of water the chances are that a shortage will not occur more than once in 21 years.[1]

The capacity of this reservoir is 1,367,600 acre-feet of water and 187,000 acres of land will share in its stored supply. In addition to these lands there are approximately 20,000 acres under the Tempe Canal which have rights in the normal flow of the river, but no rights in the stored water of the reservoir. They are not required to share in the cost of the reclamation project.

The cost of the project is assessed against the land and constitutes a lien upon it. The owners of the land will have 20 years from the

[1] Office of Experiment Stations, U. S. D. A. Bull. 235, p. 44.

date of the completion of the project in which to pay for its construction, payment to be made in annual installments without interest. Land in the valley is sold subject to this lien, and present prices do not include the project charges. If a purchaser buys land at, say, $125 per acre, he will eventually have to pay the project charges in addition to this amount. The land is all in private ownership and can be secured only by purchase. Practically all the lands entitled to water are now under cultivation.[1]

The water charges are fixed at the beginning of each year by the Reclamation Service, and are designed to cover the cost of maintenance. When these studies were made a minimum charge of $1 per acre was required of all water users, and this entitled each one to 2 acre-feet of water. About the same rate was charged for water in excess of 2 acre-feet up to 4 acre-feet. Beyond 4 acre-feet there was a graduated increase in the charge per acre-foot. Very few of the farms studied in these investigations used as much as 4 acre-feet.

The growing season extends throughout the year, and a large variety of crops may be produced, but profitable markets for only a few of these have been developed. The following table, prepared by Director R. H. Forbes of the Arizona Experiment Station, shows the seasonal distribution of crops.[2]

TABLE II.—*Fruits, vegetables, grain, and forage grown in Southern Arizona.*

Month of maturity.	Fruits.	Vegetables.	Grain and forage.
January	Oranges, pomelos	Lettuce, spinach, radishes, cauliflower.	Alfalfa and barley pasture.
February	Oranges	Lettuce, beets, turnips, cabbage.	Do.
March	Strawberries	Asparagus, carrots, green onions.	Alfalfa hay and green barley.
April	Strawberries and mulberries.	Peas, cabbage, lettuce, onions.	Do.
May	Strawberries, plums, blackberries, peaches, apricots.	Green corn, potatoes, squash, string beans.	Wheat, barley, oats, alfalfa hay.
June	Strawberries, plums, blackberries, figs, apricots, tomatoes, melons, peaches.	Squashes, cucumbers, onions	Alfalfa hay, corn.
July	Apples, pears, grapes, peaches.	Sugar beets, cucumbers	Cowpeas and alfalfa hay.
August	Grapes, figs, pears, almonds, peaches.	Chilies, egg plant, beans	Alfalfa, Egyptian corn, sorghum, cowpeas.
September	Dates, melons, pears, grapes pomegrantes, peaches.	Chilies, egg plant, potatoes, beans.	Alfalfa hay, sorghum, Egyptian corn, cowpeas.
October	Dates, quinces, pears, olives, grapes.	Cucumbers, squashes, string beans.	Indian corn, sorghum, alfalfa.
November	Dates, olives, pears, grapes, oranges, strawberries.	Celery, lettuce, beans, squashes, potatoes.	Indian corn, sorghum, alfalfa hay.
December	Dates, olives, pears, oranges.	Celery, lettuce, beets, and radishes.	Alfalfa hay and pasture.

The crops that are grown commercially in this valley, and their relative importance, are shown in the following table, taken from the

[1] The most of the statistical data for this brief history of the development of irrigation in Salt River Valley were obtained from unpublished reports furnished to the writer by officials of the United States Reclamation Service.

[2] R. H. Forbes, Bul., 235, Office of Experiment Stations, p. 19.

Reclamation Record (vol. 8, No. 2, p. 58), United States Reclamation Service:

TABLE III.—*Crop report, Salt River project, Arizona, year ending Nov. 30, 1916.*

Crop.	Area (acres).	Unit of yield.	Yields.		Values.	
			Total.	Average per acre.	Per unit of yield.	Total.
Alfalfa	81,616	Ton	326,464	4	$12.00	$3,917,568
Alfalfa seed	2,739	Bushel	10,956	4	7.20	78,883
Barley	13,295	do	332,375	25	1.05	348,994
Beans	710	do	14,200	20	3.60	51,120
Cantaloupe	1,584	Pound	7,920,000	5,000	.03	237,600
Corn, broom	55	Ton	27.5	½	125.00	3,438
Corn fodder	2,080	do	16,640	8	5.00	83,200
Corn, Indian	984	Bushel	34,440	35	1.00	34,440
Corn, sorghum	28,589	Ton	35,736	1¼	30.50	1,089,948
Cotton, long staple	5,477	Pound	1,916,950	350	.35	670,932
Cotton, short staple	556	do	194,600	350	.17	33,082
Fruits, citrus	1,259	do	2,518,000	2,000	.05	125,900
Fruits, deciduous	1,248	do	4,992,000	4,000	.025	124,800
Fruits, small	490	do	980,000	2,000	.06	58,800
Garden	623					62,300
Hay, grain	6,061	Ton	12,122	2	12.00	145,464
Oats	1,425	Bushel	57,000	40	.50	28,500
Olives	427	Pound	512,400	1,200	.05	25,620
Pasture	52,822					950,796
Potatoes, common	351	Bushel	21,060	60	1.50	31,590
Potatoes, sweet	102	do	7,650	75	1.50	11,475
Watermelons	262	Ton	3,144	12	10.00	31,440
Wheat	10,081	Bushel	252,025	25	1.15	289,829
Total	212,836					
Less duplicated areas	39,477					
Total cropped acreage	173,359					
Total						8,435,719

A large sugar-beet factory is located at Glendale, but the yields of beets were so unsatisfactory that after a trial of two years the farmers refused to grow them. The owners of the factory control several thousand acres of land in the valley, and are now planting sugar cane in the hope that this crop may be grown more profitably than sugar beets. It is too early to predict the result of this experiment.

Milk, butter, eggs, poultry, dairy products, live stock, beef cattle, and hogs are the chief products of animal industry in the valley. The abundance and high yields of forage, owing chiefly to the thriving fields of alfalfa (see fig. 3), make the valley peculiarly adapted to animal industry.

Markets are poorly developed and largely local in character. Freight and express rates are high, making it costly to ship products to any great distance. Cantaloupes and oranges are shipped to eastern markets. Beef cattle are shipped to the Pacific coast, finding their principal market in Los Angeles. Occasionally they are shipped to Kansas City. Local creameries buy milk and cream and sell butter and condensed milk on the local markets and in Arizona and New Mexico mining towns. Hay is sold to local feeders and also shipped to El Paso, Tucson, Bisbee, Douglas, Globe, Prescott, and other mining towns in Arizona and northern Mexico. It seldom goes

farther east than El Paso, or farther than Los Angeles in the other direction. Other products are sold locally and in neighboring towns. High express and freight rates on fruits and vegetables make it difficult for Arizona growers to compete with California in the sale of these products, even in towns within 100 miles of the farms upon which they are grown. Cotton, on the other hand, is shipped to eastern markets under extremely favorable freight rates, granted by the railroads for the purpose of assisting in the development of this enterprise.

At the present time there is a strong sentiment among the farmers for cooperation, including cooperative marketing, and efforts in this direction may succeed in developing other enterprises that will prove

FIG. 3.—A thrifty alfalfa field in Salt River Valley.

profitable, or in strengthening some of the weaker enterprises now carried on; but until such development takes place enterprises will be practically limited to the animal industries mentioned above and to the crops listed in Table III, in about the relative importance shown there, except that with a stable price of 20 cents or more a pound for lint the Egyptian cotton enterprises will undoubtedly gain rapidly in relative importance. This will be more fully discussed when a detailed consideration of farm enterprises is taken up.

The valley is supplied with transportation by a branch of the Santa Fe Railroad which connects with the main line at Ash Fork, and by a branch of the Southern Pacific which connects with the main line at Maricopa. The country northwest of Phoenix is served by the

Santa Fe, and the country west, east, and southeast of Phoenix by the Southern Pacific. Both systems center in Phoenix.

YUMA VALLEY.

Yuma Valley constitutes that portion of the valley of the Colorado River lying between the town of Yuma and the Mexican border. It is bounded on the north and west by the river, and on the east by mesa lands. It contains approximately 55,000 acres. Its soils are all sands, sandy loams, and loams deposited in recent geologic times by the Colorado River. They are described and mapped in the bulletin isued in 1902 by the Bureau of Soils of the United States Department of Agriculture entitled "A Soil Survey of the Yuma Area, Arizona." The valley is under one of the projects of the United States Reclamation Service, which is designed to irrigate 130,000 acres of lands in California and Arizona, 40,000 acres of which lie on the mesa at an elevation of about 60 feet above the valley, and to which water will be raised by pumping. The mesa lands are adapted to the raising of grapes and citrus fruits, but have not as yet been opened for settlement. The valley lands have all been filed upon and farms can be obtained only by purchase. When the irrigation project is completed it will furnish abundance of water to all lands under it.

As stated in the Fourteenth Annual Report of the United States Reclamation Service, the cost of the project to June 13, 1915, was $7,936,000 and at that time 57 per cent of it was completed. Of this cost, $2,035,310 was for a flood protection system. The proportion of the cost of the project to be assessed against the land has not yet been determined, but whatever the assessment it will constitute a lien upon the land. As in Salt River Valley, lands in Yuma Valley are sold subject to the lien for the cost of the irrigation project, and this cost is not covered by the purchase price of the land.

The climate of this valley is very similar to that of Salt River Valley, the summers being slightly longer and warmer, and the rainfall about half as great. The growing season for alfalfa and cotton is somewhat longer, assuring slightly greater total annual yields. The soil and climate seem to be particularly well adapted to the production of alfalfa seed, and this is the most profitable crop grown. In other respects crops are quite similar to those grown in Salt River Valley and need no special discussion here. Their relative importance is shown in the table following taken from the Reclamation Record (Vol. 8, No. 3, p. 106), United States Reclamation Service.

Animal industry is not as far advanced in Yuma Valley as it is in Salt River Valley. A creamery has been built recently at Yuma, and the owner by lending money for the purchase of cows is inducing

farmers to go into the dairy business; the industry is now expanding and with the continuation of present economic conditions promises to become one of the leading enterprises of the valley. The fattening of beef cattle is a leading enterprise with the larger farmers, while the production of poultry and pork is carried on to a greater or less extent on the smaller farms.

TABLE IV.—*Crop report, Yuma project, Arizona-California, year of 1916.*

Crop.	Area (acres).	Unit of yield.	Yields:		Values.	
			Total.	Average per acre.	Per unit of yield.	Total.
Alfalfa hay	10,880	Ton	28,029	3.58	$9.52	$266,898
Alfalfa seed	8,100	Bushel	43,930	5.42	7.48	328,725
Barley	1,195	do	28,086	23.50	.69	19,433
Beans	234	do	2,428	10.37	4.20	10,215
Indian corn	55	do	1,875	34.00	.72	1,315
Corn sorghum	4,897	do	195,799	39.97	.64	124,915
Cane and cane fodder	1,832	Ton	5,902	3.22	3.27	19,289
Cotton	4,670	Pound	2,289,430	490	.174	397,420
Cotton seed	4,670	do	4,582,610	981	.015	70,277
Fruit	89					4,440
Truck	338					25,038
Hay, except alfalfa	901	Ton	1,075	1.20	9.66	10,383
Pasture	7,282					82,643
Wheat	456	Bushel	7,220	15.84	1.39	10,032
Estimated additional revenue derived from pasturing alfalfa and stalk lands and feeding alfalfa straw after thrashing						64,350
Less duplicated areas	17,316					
Total cropped acreage	28,283	Grand total				1,435,403

Markets and market facilities are quite similar to those in Salt River Valley. Connections with the East and with the Pacific coast are afforded by the Southern Pacific Railroad, which passes through Yuma. Recently a railroad traversing the entire length of the valley has been constructed on the Colorado River levee. The road connects with the Southern Pacific at Yuma and furnishes local transportation from the valley to the main railway line.

Agricultural development[1] in Yuma Valley began in 1886, when Capt. Ingalls and Mr. John Gandolfo established a pumping plant near a lagoon in the lower part of the valley. They were followed by a few other pioneers, and in 1890 there were 6 irrigators in the valley, with a total of 555 acres under cultivation. In 1891 the Yuma Pumping Irrigation Co. was formed and established a pumping plant near the town of Yuma, which drew water for irrigation from the Colorado River. The same year the Yuma Fruit Co. was organized and began developments on 329 acres, 4½ miles south of Yuma, but the enterprise was finally abandoned. At this time a few settlers began coming into the valley, but immediately experienced

[1] The facts for this brief history of the early development of Yuma Valley were furnished by Miss C. Louise Boehringer, superintendent of the schools of Yuma County.

trouble with the heirs of an old Spanish land grant, who claimed title to the land. Their claims were purchased by the Yuma Pumping Irrigation Co., and its title to the lands was confirmed by the Court of Private Land Claims. This decision was reversed by the Supreme Court, and about 1895 the land was thrown open to settlers by special act of Congress.

In 1907 three irrigating companies were supplying water to approximately 6,000 acres of farm lands in the valley, by means of pumping plants. These pumping plants and their canal systems were purchased by the United States Reclamation Service in 1907 and 1908. Irrigation by pumping was continued until 1912 when gravity water developed by the project at Laguna Dam was conducted to the valley through a large syphon under the Colorado River. The development of the lands has progressed rather slowly since that date. In 1910 approximately 10,000 acres were irrigated, most of this land being in Yuma Valley, on the Arizona side. In 1915 water was furnished by the project to a total of 27,000 acres, approximately 22,000 acres of which are in Yuma Valley, on the Arizona side of the river.

While the general topography of the valley is level, the immediate surface is rough, due to old river washes and lagoons, and to more recent sand dunes. This makes preparation for irrigation difficult and expensive. The average cost of clearing land and leveling it for irrigation approximates $40 per acre. Lack of sufficient capital to do this work properly has retarded the development of the valley and it has been further retarded by the high prices at which undeveloped lands are held for sale by their present owners.

GILA VALLEY.

This valley lies near the center of Graham County and extends from San Jose, a few miles above Solomonville, the county seat, to San Carlos. It contains about 24,000 acres of irrigated lands, the greater portion lying on the south side of the Gila River, which furnishes the water for irrigation. There is no Government irrigation project here and no storage water is available. The river is subject to periodic floods occurring during the rainy seasons, and since the diversion dams are of a temporary nature (see fig. 4) they have to be renewed or repaired after each flood. There is usually an ample supply of water, however, for the lands under cultivation, though temporary shortage sometimes occurs in June, when the river is at its lowest stage. The soils are of alluvial origin and vary in texture from light sands to heavy clays. They are described and mapped in a bulletin[1] issued in 1903 by the Bureau of Soils of the United States Department of Agriculture. There is evidence that

[1] A Soil Survey of the Solomonville Area, Arizona.

this valley also was irrigated by prehistoric peoples, remains of their canals still being visible.

The climate is somewhat cooler than in Salt River Valley, the elevation being about 1,500 feet greater, and the seasons are shorter. Neither dates, citrus fruits, nor olives can be grown here, and the season is rather short for Egyptian cotton. Only the hardier vegetables, such as cabbages and radishes, can be grown during the winter season, and these are often injured by frosts, temperatures as low as 8° F. having been recorded. Alfalfa furnishes much less winter pasturage than in Salt River Valley, its growth being distinctly checked during the winter months. On the other hand, the growth is not seriously checked during the midsummer season, as it is in Salt

FIG. 4.—Temporary dam and headgate of irrigating canal, Gila River.

River Valley and Yuma Valley, and the total yields of hay are practically the same in the three valleys.

The annual rainfall is approximately 10 inches, coming in two short rainy seasons, one in winter and the other in midsummer. The rains are not considered beneficial to agriculture, and those coming in midsummer are distinctly injurious, frequently doing great damage to crops being harvested. Crop production depends wholly upon irrigation for its water supply.

High mountains surrounding the valley modify the summer heat, making the climate agreeable and healthful.

The leading money crops are alfalfa hay, wheat, and barley. More corn and oats and less grain sorghums are grown here than in Salt River Valley. Deciduous fruits when properly cared for do well, especially apples, peaches, apricots, and plums. The codling moth, root rot, and

woolly aphis have interfered with the development of apple orchards, while lack of dependable markets has prevented any great development of the stone fruits. On the whole, considerably less fruit is produced in the valley now than formerly.

Until very recently the excellent market for alfalfa hay has prevented any great development of dairying and beef production. One creamery is operated at Safford, but it is not sufficiently well patronized to enable it to operate at its full capacity. A few men feed steers for the market, and a few hogs are raised, but the production and sale of alfalfa hay is by far the most important enterprise carried on. Poultry is an important side line to other enterprises here, as in both the other valleys described.

Transportation is furnished by the Gila Valley, Globe & Northwestern Railroad, which leaves the main line of the Southern Pacific at Bowie and extends to Globe, traversing the entire length of the valley.

METHOD OF INVESTIGATION.

The farmers were visited personally by the investigator, and a complete record of a year's business obtained. To take into account the effect of economic or climatic differences in seasons the investigation was extended over a period of three years, beginning with the year 1913. Complete records were obtained of the business transacted on 162 farms during the year 1913, and similar records were obtained on 378 farms for 1914 and on 185 farms for 1915, making a total of 725 farms studied during the three years. Ninety-eight of these records were either inaccurate or the farms were not considered typical of the districts studied and were eliminated from the general tabulations presented in this bulletin.

The area studied in Salt River Valley extends in a belt 40 miles long from Peoria in the northwest part of the valley to Gilbert in the southwest. At Peoria the belt has a width of 14 miles. It narrows to a width of 2 miles at Tempe, and widens again to 11 miles at Mesa and Gilbert. With few exceptions, every farm in this belt was visited, and studies were made on all typical farms that had been in operation long enough to have established a definite system of farming. The total area of the farms studied in this valley is 59,676 acres, or nearly one-third of the total area cultivated.

In Yuma Valley, studies were made on the farms in the upper end of the valley near Yuma and those in the lower end of the valley surrounding Somerton. In addition to these, all farms within 2 miles of the road connecting these two localities were visited. In this way farms on practically all the soil types of the valley were studied, the majority of them being on the two more common types, the Imperial loam and the Imperial sandy loam. The total area of the farms studied in this valley is 6,486 acres, or a little more than one-fourth of the area under cultivation in 1915.

In the Gila Valley, nearly all the farms between Fairview and the San Simon wash were visited. These farms are in a narrow belt on the south side of the Gila River, which varies in width from 1 to 4 miles and extends up and down the river a distance of 20 miles. The irrigated area in Gila Valley extends several miles farther, both up and down the river, and there are farms on both sides of the river, but it is believed that the belt in which these studies were made contains farms representative of the whole district. The 105 records obtained in this valley represent a total of 8,301 acres, constituting not far from one-third of the total area under cultivation.

The farmers responded heartily to the questions asked, and are to be complimented upon the accuracy of the data furnished. Many of them kept books, which were placed in the hands of the investigator, and from which nearly every item in the record was obtained in exact figures. To the question, "Do you keep farm accounts?" asked of 647 farmers, 179 answered "Yes," and 181 answered that they kept a partial system of accounts. It thus appears that 55.6 per cent of the farmers in the irrigated valleys of southern Arizona keep some form of farm accounts.

Supplementing the more complete systems of accounts, almost every farmer interviewed had some form of pocket memoranda from which he could give many of the items in exact figures. In this manner, and from the sets of books examined, the following items of the data herein presented were obtained in exact figures from practically every farmer interviewed: Receipts from sales of hay, grain, and cotton; thrashing, ginning, and baling charges; taxes, water rent, sales and purchases of live stock, and the amount paid out for steady labor and for cotton picking.

Besides the items wholly or partially estimated, 28.3 per cent of all sales of dairy products above $100 were reported in exact figures either from books or creamery statements. Among those who estimated this item 27 farmers were selected at random, and their estimates compared with the exact figures on the books of the creameries patronized; the average of their estimates was exact to within 1.3 per cent. The increase in numbers of live stock was obtained in exact figures; but the value of live stock gains was estimated. These estimates were checked by comparison with prices obtained for similar live stock at cash sales, and the prices were in very close accord with the estimates given by the farmers. The estimated value placed upon farm machinery was checked by comparisons with prices at several retail machinery stores.

The conclusions that may be drawn from these investigations are therefore based upon data by far the greater portion of which is exact and in which, where estimates have been used, the element of error in each case has been reduced to a minimum.

STANDARDS USED IN THIS BULLETIN FOR MEASURING SUCCESS.

The rate of interest earned on investment is important for our purpose only on farms of large capitalization, where it may be assumed that the most of the operator's time would be required in supervision to make his capital earn current interest rates, whether invested in a farm or loaned on farm mortgages. On the majority of farms, however, the farmer must be both a laborer and a capitalist, and the amount earned for his labor on the farm is frequently of much greater importance than the interest earned on the investment. The amount so earned by the operator's labor is termed the "labor income"[1] of the farm. It is the most important measure of success for the renter, the farmer heavily mortgaged, or the farmer with small capital. It is an important standard of measurement when the farm is viewed from what has been termed the "cold business standpoint," especially if the farm could be sold readily and the money loaned at current interest rates. It then becomes a measure of the value of the investment.

But many farmers do not look upon the farm as an investment. They regard it from the standpoint of a home and the means of independence in earning a living. For them the standard of living afforded by the farm is the most important consideration, and they are chiefly interested in the magnitude of the farm income, which determines this standard.

It will perhaps be conceded that a minimum measure of success in farming would be reasonable wages for the operator's labor, or a farm income sufficiently large to provide the farm family a comfortable living. Both measures will be used in this bulletin, and a brief discussion of how they are obtained is in order at this point.

What constitutes "reasonable" wages for the farmer's time may be determined by comparison with wages paid to farm laborers. The minimum wage for steady farm help, paid in the majority of cases to Mexican laborers, is $35 per month, with room and board. American laborers usually get more, the amount varying up to $75 per month, with room and board, for the best dairy help. Foremen and managers get still higher wages, up to $1,500 per year with house and garden furnished and including the privilege of keeping poultry and at least one cow. The value of the board given to farm help

[1] The labor income is found by subtracting interest on the total investment at current rates from the farm income. It represents the earning power on that farm of the farmer's labor and managerial ability, and may be sometimes referred to in this bulletin as the "farmer's wages." In southern Arizona the current interest rate on farm mortgages is 8 per cent. The labor income has therefore been determined by subtracting 8 per cent on the total investment from the farm income.

The farm income is the net receipts from the year's business. It is found by subtracting the total expenses, except interest on borrowed money, from the total receipts; gains from increased value of live stock and other increase in inventory that may not have been converted into cash being included in receipts and depreciation being included in expenses. If the farmer is out of debt the farm income represents all of his living and total savings except such items of food, fuel, and house rent as may be contributed to the family living by the farm direct. If he is in debt he must pay interest on borrowed money out of the farm income.

was obtained by asking each farmer to estimate the amount paid out per month for materials contributing to the board of such labor and omitting the materials contributed by the farm direct. The estimates varied from $5 to $25 per month for each laborer, the average being $14. This amounts to $168 per year. Studies show that the farm contributes to the family living about $88 per adult unit per year in board and house rent, bringing the total value of these items furnished to the farm laborer up to $256. At $35 per month the money paid him would amount to $420, bringing the total up to $676 per year, when money, board, and house rent are all included. This may be considered the minimum wage for farm help. The maximum wage, excluding foremen, amounts to $1,156, computed in the same manner. Since these studies were made wages have advanced considerably, but there has been a corresponding advance in prices of farm products.

Opinions may vary as to what constitutes a comfortable living for a farm family, and this subject can be discussed only in a general way. Living requirements in southern Arizona are comparatively high. By studies made on the 725 farms visited during this investigation data have been secured that may be considered reasonably accurate on certain items of living requirements, and these data are presented here.

It has just been stated that data obtained upon the cost of boarding hired labor showed an annual expenditure of $168 per adult unit for food materials purchased. The average number of adult units[1] in the family on 476 farms of 80 acres or less upon which data were taken for the purpose of computing living requirements was 3.5, excluding hired help. At the rate of $168 per unit this would require the expenditure of $588 annually per family for the purchase of food materials. In addition to the purchased materials the family would have the food materials contributed directly by the farm, consisting of orchard and garden products, milk, butter, eggs, and meat. All cereal foods are purchased, including flour.

Computations based upon data secured on 476 farms gave an average of $67 as the value of the milk and butter, $113 as the value of the eggs, $48 for all meats, and $32 for all orchard and garden products, making a total of $260 as the value of all food products contributed to the family living and the board of hired labor by the average irrigated farm of 80 acres or less in southern Arizona. There were an average of 3½ adult units in the family and ½ an adult unit of hired labor, making 4 adult units among whom this food was divided. This is an average of $65 per adult unit and amounts to an average of $228 per farm family, which, when added to the $588 in purchased food, brings the total food requirements up to $816.

[1] In finding the adult equivalent of children the average of the equivalents in dietary requirements of children under 16 years of age worked out by Atwater and published in Farmer's Bulletin 142, (p. 35) was used. This average is 0.6 adult units per child. All children 16 years or older were counted as adults.

These computations were made in the following manner: The total meat furnished by the farm was computed by reports from 102 farms, in which the poultry, pork, and other meat products furnished by the farm were itemized. The eggs and dairy products were computed from differences in sales of eggs per hen and in sales of milk products per cow between farms on which the hens and cows were kept for family purposes and those on which hens and cows were kept primarily for commercial purposes. The computations assumed that the family cows and the family hens were equal in quality to the cows and hens in the commercial herds and flocks, an assumption believed to be not far from the fact in southern Arizona. The orchard and garden products were computed from data taken on the farms showing the percentage of farmers having gardens and bearing orchards, making use for this purpose of data collected by Mr. W. C. Funk[1] of this office showing the percentage of vegetables and of fruit in the total food requirements of farm families in 10 different States.[2]

[1] W. C. Funk, "What the farm contributes directly to the farmer's living," Farmers' Bulletin 635, pp. 9, 12, and 13.

[2] The computations, partially in detail, are as follows:

Dairy products.—Out of a total of 476 farms studied for this purpose 186 kept only family cows, the total number of cows on the 186 farms being 416, or 2.2 cows per farm. These cows supplied the farm table with dairy products, and in addition a surplus of $20 per cow was sold. There were 211 farmers engaged in dairying as a commercial enterprise, who kept a total of 2,924 cows. Assuming that they also required an average of 2.2 cows per farm for family purposes, there would be a total of 464 family cows on these 211 farms, leaving 2,460 cows used strictly for commercial purposes. Assuming further that these family cows also produced a surplus of $20 per cow above table requirements, the total sales from the 464 family cows would amount to $9,280. This sum, subtracted from the total sales on the 211 farms, amounting to $159,338, leaves $150,058 as the value of the total dairy products from 2,460 cows, which is an average of $61 per cow. We have assumed the family cows to be as good as the commercial cows, so that $61 per cow also represents the total value of their products, from which a surplus of $20 per cow was sold, leaving $41 per cow as the value of the dairy products consumed on the farm. Since an average of 2.2 family cows per farm were found, the total value of the dairy products consumed on the farm is in round numbers $90 per farm. Young calves would consume at least $10 of this (the exact figures given by two dairymen keeping over 100 cows each were $5.25 per calf), leaving $80 as the value of the dairy products consumed on the farmer's table on each farm where cows were kept. There were 79 farmers out of the 476 who kept no cows, which brings the average down to $67 per farm for the 476 farms studied.

Eggs.—The value of the eggs used on the farmer's table was computed in the same manner as the dairy products. Of the 476 farms, 370 kept only family flocks of poultry, while 85 made poultry a commercial enterprise. The family flocks averaged 94 hens, from which a surplus of eggs valued at 73 cents per hen was marketed. The total product per hen of the commercial flocks was $2.03, leaving $1.30 per hen as the value of the eggs consumed on the farm, or a total of $122 per farm. The value of the eggs required for hatching was $4 per farm, leaving $118 per farm as the value of the eggs consumed on the farmer's table, on all farms keeping hens. Of the 476 farmers, 21 kept no hens, reducing the average to $113 per farm for the 476 farms studied.

Meats.—The meat contributed to the farmer's table by the farm consists almost entirely of poultry and pork. Of 476 farms studied, 455 kept poultry, and of these 95 reported the value of the poultry consumed on the farm. Computations based on these reports give an average of $25 per farm as the value of the poultry contributed to the farm table on the 476 farms. Of these farms 268 kept hogs, and 59 of these reported the value of the pork contributed by the farm to the farm table, the average being $20. The average value of all other meat contributed to the farm table by the farm is $3 per farm, based on 102 reports. This makes a total of $48 worth of meat contributed to the farm table by the farm, which is the exact average of the 102 farms reporting.

Garden and orchard products.—Out of 532 farms reporting, only 121 had gardens, or 22.7 per cent of the total number. Orchard data were taken on 702 farms and 231 of these or 32.9 per cent, reported bearing orchards. Mr. W. C. Funk has shown that fruit constitutes 6.3 per cent of the total food of the farm families in 10 different States, and that 66.6 per cent of this fruit is furnished by the farms. He has shown that in the same 10 States vegetables constitute 11.5 per cent of the total food of the farm families and that the farm contributes 78.2 per cent of the vegetables consumed. Assuming these figures to hold good in Arizona, and multiplying by the numbers having gardens and orchards, we find that the garden contributes 2.0 per cent of the total food required, and the orchard 1.4 per cent. In round numbers, this amounts to $32 per farm.

Recapitulation.—These calculations, which are reasonably accurate, give $67 in dairy products, $113 in eggs, $48 in meats, and $32 in vegetables and fruit contributed to the family living and board of hired labor by the farm direct.

The value of house rent, which is a direct contribution to the family living by the farm, is determined by the value of the houses found on the farms. The average value of the farm dwelling in all size groups of farms from the smallest farms up to those of 80 acres is nearly the same, and the average for the 476 farms of 80 acres or less is $944. On the larger farms the average value of the farm dwelling is greater than this figure. Houses in southern Arizona rent for about 10 per cent of their value. This gives $94 as the average value of the house rent contributed by the farm on the 476 farms under consideration. These computations are summarized in Table V.

TABLE V.—*Average contribution of the farm to the living of the family and board of hired labor on 476 irrigated farms in southern Arizona.*

Items.	Value.	Items.	Value.
Eggs	$113	House rent	$94
Dairy products	67		
Meat	48	Total	$354
Fruit and vegetables	32		

Including hired labor, there were on an average 4 adult units on these farms, making the contributions of the farm $88.50 per person. The farm family averaged the equivalent of 3.5 adult units, which makes its share of the living obtained from the farm in round numbers $310. Adding this to the $588 of purchased food gives a living requirement of $898 for food and house rent. This leaves other items of living expenses such as fuel, clothing, doctor bills, newspapers and periodicals, church and benevolent contributions, recreations and amusements, books, life insurance, and household furnishings unprovided for. We have no data on these items for Arizona, but if they should be estimated at $400, a very conservative estimate, we have in round numbers $1,300 as the living requirement of an average farm family in the irrigated valleys of southern Arizona, of which the farm contributes $310 and the balance of $890 must be purchased out of the farm income and the earnings of any members of the farm family other than the operator, either upon the farm or off, the value of such labor on the farm having been charged against it as an expense in determining the farm income. This estimate does not provide for the payment of any interest on borrowed money, nor does it provide for the payment of the construction charges on the irrigation projects in Salt River and Yuma Valleys. Considering the fact that these charges will not be less than $2.80 per acre annually for a period of 20 years in Salt River Valley, and considerably more than this amount for the same period of time in Yuma Valley, it appears from the foregoing figures that a farm income of $1,000 above the food and house rent obtained from

the farm direct would fall considerably short of furnishing a comfortable living and the education of the children to an average farm family on the irrigated farms in southern Arizona, even if the family were out of debt; and the shortage would be much greater if the family were obliged to borrow much of the money required for the purchase and development of the farm.

TYPES OF FARMING.

With the exception of a few small fruit and poultry farms, alfalfa is the basis of all farming in the irrigated valleys of southern Arizona. There are always a few hundred acres of experimental crops in this region, for Arizona farmers have long been awake to the limitations of alfalfa farming, and a few thousand acres of grain crops are grown, the grain crops being used as a means of rotating the alfalfa fields and for growth upon land not sufficiently well supplied with water to make the alfalfa crop a reliable one; but in the main a thrifty alfalfa field taking in most of the farm has been the ultimate goal of by far the greater number of farmers who have settled in these districts.

On 627 farms, the records of which were used in the study of type, there were 39,803 acres in alfalfa, out of a total crop acreage of 59,932. This is 66.4 per cent of the total crop acreage, and this percentage holds good for farms of all sizes except those smaller than 20 acres; and even in this group of small farms over 50 per cent of the total crop acreage is in alfalfa.

The type problem, then, for Arizona farmers has been largely to find the most profitable form in which to market the alfalfa crop. Efforts in this direction have resulted in the following types of farming: Hay farming, sale of pasture, production of alfalfa seed, dairy farming, fattening beef cattle, diversified farming,[1] and production of miscellaneous types of live stock. These will be discussed in the order named. In considering the tables herein presented, however, it should be remembered that it is unsafe to draw conclusions from averages where only a small number of farms appear in any group, and that in general the larger the number of farms appearing in a group the more reliable are the conclusions to be drawn from average results.

HAY FARMING.

Of 627 farms 85 were engaged chiefly in the production and sale of alfalfa hay, obtaining an average of 69.7 per cent of their total receipts from this source, while 40 more combined the sale of hay with some other enterprise, giving such enterprise about equal

[1] All farms are classified as diversified when the interest of the operator has been about equally distributed among three or more enterprises.

prominence, and obtaining over 80 per cent of their total receipts from the two enterprises. Of these, 37 combined hay farming with either grain farming or dairying, 1 combined it with the production of beef cattle, and 2 combined it with poultry raising. Hay farming is found on farms of all sizes, though the medium and larger-sized farms (see fig. 5) are better adapted to the enterprise than the smaller

FIG. 5.—An alfalfa hay farm—cutting the first crop of the season.

farms, as will be shown in tables presented farther on. The average results obtained in hay farming and its various combinations are shown in Table VI:

TABLE VI.—*Results obtained in hay farming in the irrigated valleys of southern Arizona, 1913 to 1915.*

Type of farming and percentage of receipts from leading enterprises.	Number of farms.	Average area.	Total receipts.	Farm income.	Labor income.	Number failing to make 8 per cent on investment.
		Acres.				
Hay, 69.7	85	100	$3,742	$2,110	$420	29
Hay, 43.7 Grain, 36.4	19	96.7	3,212	1,803	143	8
Hay, 40.5 Dairy, 41.1	18	63.0	2,792	1,709	556	6

Success in hay farming is greatly influenced by both price and yield. The effect of increasing yield per acre with price remaining nearly constant is shown in Table VII:

TABLE VII.—*Effect of increasing yield per acre on success in hay farming.*

Yield.	Number of farms.	Average yield.	Average price.	Average area.	Number failing to make 8 per cent on investment.	Average receipts.	Average farm income.	Average labor income.
Tons per acre.				*Acres.*				
4.5 and under	17	3.7	$7.70	113	14	$2,606	$1,318	—$312
4.6 to 5.5	22	5.1	8.70	119	7	3,851	1,981	101
5.6 to 6.5	17	6.0	8.30	134	5	5,167	2,804	464
6.6 to 7.5	21	7.0	9.00	95	4	3,779	2,202	524
Over 7.5	22	9.0	9.10	61	3	3,478	2,321	1,037

The price of the product also has a great influence on success in hay farming. Before the considerable expansion of the area in alfalfa in Arizona due to increased water supply, and while the Reclamation

FIG. 6.—Curing alfalfa hay in cocks—Salt River Valley.

Service was actively engaged in operations requiring a large amount of team work, the demand for alfalfa hay was strong and prices were comparatively high, but about the close of the year 1913 prices dropped to low figures and remained low through 1914 and 1915. The market was again stimulated in 1916 by the presence of United States troops on the Mexican border and prices rose to an abnormally high figure. Comparatively high prices were obtained late in the season of 1915 and early in the season of 1913, so that a considerable range in price is represented in the records used for this study. The price is also affected by the manner of curing and handling the hay, those farmers who cure in cocks (see fig. 6) and handle with pitch

forks receiving higher prices than those who cure in the windrow and handle with the buck rake. Better prices are also obtained by those farmers who protect their hay during storage by the use of hay barns—and they also have a smaller percentage of damaged hay.

The effect of increasing price on success in hay farming, with yields remaining nearly constant, is shown in Table VIII.

TABLE VIII.—*Effect of increasing price per ton on success in hay farming in southern Arizona.*

Price per ton.	Number of farms.	Average price per ton.	Average yield per acre.	Average area.	Number failing to make 8 per cent.	Average receipts.	Average farm income.	Average labor income.
			Tons.	*Acres.*				
$6.90 and under	15	$6.00	5.3	92	8	$2,759	$1,548	—$23
$7 to $7.90	13	7.40	5.9	162	6	5,148	2,580	327
$8 to $8.90	29	8.40	6.0	90	12	3,413	1,847	242
$9 to $9.90	17	9.20	7.1	75	5	2,920	1,763	292
$10 and over	25	10.70	6.9	101	1	4,542	2,761	944

When allowance is made for difference in size of farm, it is seen that both labor income and farm income increase steadily as the price rises from an average of $6 per ton to an average of $10.70 per ton, but satisfactory results from the standpoint of labor income are not obtained until the price is above $10 per ton. It also appears from both this table and table VII that high yields and high prices tend somewhat to go together. This is due to the fact that the farmers who take the best care of their fields also use methods which produce a higher quality of hay, and a greater percentage of them hold their hay for higher prices. The last line in Table VII indicates that satisfactory results are not obtained until both yield and price approach their maximum.

These tables, showing the effect of price and yield on the farm income and labor income, tend toward the general conclusion that with economic conditions as they were during the three years 1913, 1914, and 1915, hay farming is highly profitable only with both maximum yields and maximum prices. Hay farming was less profitable than dairying, the feeding of beef cattle, or the production of alfalfa seed, and was less profitable than cotton farming when the price of cotton was 20 cents per pound, as will be shown in tables to be presented farther on. As the percentage of total receipts derived from hay rose there was a general decrease in both farm income and labor income up to the point where the receipts from hay constituted from 45 per cent to 65 per cent of the total receipts. This indicates that hay farmers were not generally successful in trying to combine some other enterprise with the production of hay for the market. But while those farmers who devoted all their attention to hay farming were more successful than those who tried to combine it with some enterprise other than cattle, they were still much less

successful as a general proposition than those farmers who sold little or no hay. The effect of increasing percentage receipts from hay on farm income and labor income is shown in Table IX:

TABLE IX.—*Depressing effect on farm income and labor income of increasing percentage of receipts from sales of hay, 1913 to 1915.*

Per cent of receipts from hay.	Number of farms.	Average percentage receipts from hay.	Average area.	Number failing to make 8 per cent.	Average receipts.	Average farm income.	Average labor income.
			Acres.				
0 to 5	327	0.6	119	66	$5,157	$3,104	$1,079
5.1 to 25	128	12.3	112	36	4,335	2,691	734
25.1 to 45	74	33.9	78	24	2,985	1,800	470
45.1 to 65	44	53.4	100	15	3,480	1,913	18
65.1 to 100	56	77.6	105	20	3,931	2,222	476

SALE OF PASTURE.

The sale of pasture is an important side line on nearly all hay farms, especially those in Salt River and Yuma Valleys. A considerable crop of "aftermath" which grows after the last cutting of hay in the season is usually marketed in the form of pasture. On the heavier soils irrigation during the hottest part of midsummer causes a growth of wild grasses known as "water grass" to spring up in the fields, which distinctly checks the growth of the alfalfa. The midsummer crop is also injured more or less by worms produced by a common butterfly. For these reasons it is often more profitable to market this crop as pasture than to cut it for hay. More or less hay is always damaged by the local showers of the midsummer rainy season, and by feeding this hay to cattle along with green forage it often may be marketed when otherwise there would be no demand for it.

The pasture is paid for by the cattle feeders at a stated price per head per month. The price varies from being occasionally as low as $1 per head per month to $2.50 per month. The higher prices prevail during the winter season, when usually some second class hay is fed along with the pasture. Of the farms studied there were but 13 upon which the sale of pasture was of sufficient importance to make it a leading enterprise. Their average size was 150 acres, and the average receipts, farm income, and labor income were $3,673, $2,454, and $417 respectively. These results are slightly lower than those obtained when the sale of hay was a leading enterprise.

ALFALFA SEED.

The production of alfalfa seed for the market is a leading enterprise in Yuma Valley and in what is known as the "Buckeye" country, an isolated strip of irrigated land on the Gila River below Salt River Valley, having the town of Buckeye at its center. The enterprise is

of little importance in Salt River Valley or in Gila Valley, the yields in these districts being unsatisfactory. Either one or two crops per year may be produced, according to the inclination of the grower. In Yuma Valley, where all the alfalfa-seed farms studied for this bulletin were found, the yields are usually highly satisfactory, the average for the farms studied being 285 pounds per acre; and as much as 1,300 pounds of salable seed per acre from two crops in a single season has been reported on one farm. It is the most profitable enterprise found in this valley, constituted the principal source of receipts on 12 of the farms studied, and was an important side line on many others. The 12 farms averaged 71 acres in size, and the average results obtained were as follows: Receipts, $3,750; farm income, $2,479; labor income, $1,273. The sale of hay was made an important secondary enterprise on these 12 farms, the average receipts from hay being 22.9 per cent of the total receipts, while alfalfa seed furnished an average of 58.6 per cent of the total.

DAIRY FARMING.

Dairy farming is a well-established enterprise, and is steadily growing in importance. The mild winter climate, the long growing season, and the abundance of green forage due to the thrifty alfalfa plant, all combine to make southern Arizona a congenial home for the dairy cow. The farmers are coming more and more to realize the stability of the dairy enterprise, and at the present time there are more than twice as many men making dairying a leading enterprise as can be found engaged in its nearest competitor, hay farming.

Of 627 farms studied, dairying was a leading enterprise on 178, contributing an average of 67.7 per cent of the total receipts. Upon 38 farms dairying was combined with some other enterprise, the two enterprises contributing more than 80 per cent of the total receipts. In addition to these 216 farms upon which dairying was the most important enterprise, there were 109 diversified farms upon which dairying contributed an average of 22.3 per cent of the total receipts, a larger amount than was contributed by any other one of the various enterprises found on these farms. The general results obtained in dairy farming are presented in Table X:

TABLE X.—*Results obtained in dairy farming in the irrigated valleys of southern Arizona, 1913 to 1915.*

Type of farming and percentage of receipts and leading enterprises.	Number of farms.	Average area.	Number failing to make 8 per cent.	Average Total receipts.	Average farm income.	Average labor income.
		Acres.				
Dairy, 67.7 Poultry, 7.5	178	83	22	$3,859	$2,600	$1,081
Dairy, 49.3 Poultry, 36.8	9	21	5	1,366	1,012	173
Dairy, 41.1 Hay, 40.5	18	63	6	2,792	1,709	556

Success in dairy farming is greatly influenced by the productivity of the farms and by the quality of the live stock carried. The productivity may be measured in terms of productive animal units [1] carried per 100 acres of land, making due allowance for the amount of feed purchased.

The following tabulation of dairy farms will show the steady increase in receipts, farm income, and labor income, with the increasing number of productive-animal units carried per 100 acres of land:

TABLE XI.—*Effect of increased productivity of land on success in dairy farming in the irrigated valleys of southern Arizona, measured in terms of productive-animal units carried per 100 acres of land.*

Productive-animal units per 100 acres.	Average number productive animal units per 100 acres.	Number of farms.	Average area.	Number failing to make 8 per cent.	Value of feed purchased.	Average Total receipts.	Average farm income.	Average labor income.
			Acres.					
30 and under	26.1	11	108	5	$61	$4,004	$2,629	$795
30.1 to 60	48.0	67	87	17	62	3,409	2,277	773
60.1 to 90	72.4	72	79	5	101	3,900	2,678	1,201
Over 90	128.7	39	57	3	188	4,057	2,578	1,180

The average contribution of animals to the receipts on all of these farms was 86.3 per cent of the total, while crops contributed an average of only 12.1 per cent. It may fairly be assumed, then, that the increased income was due to larger numbers of animals. While more feed is purchased on the farms carrying the largest number of animal units per 100 acres, the amount purchased is not large on any of the farms; and it may safely be assumed that the increased number of animal units is due to increased productivity of the alfalfa fields; also, that this increased productivity has resulted in greater total receipts as well as a larger farm income and labor income. The average number of dairy animal units per 100 acres carried on these four classes of farms was 19, 35, 53, and 91, respectively.

Dairy cows are fed practically the entire year on green forage consisting chiefly of alfalfa pasture (see fig. 7). Increasing productivity resolves itself, therefore, into the problem of increasing the carrying capacity of the alfalfa fields. It has been found that steady pasturing of a single field throughout the year greatly reduces its carrying capacity. The plants are eaten so close to the ground that they fail to produce the shade necessary to prevent the rapid growth of water grasses, bermuda grass, and noxious weeds that soon crowd

[1] An animal unit is the equivalent of a full-grown horse, steer, or cow. Equivalents in other animals are determined by food requirements, and in this bulletin 2 calves, heifers, or colts, 7 sheep, 5 hogs, 10 pigs, 100 chickens, or 50 turkeys are, respectively, regarded as representing food requirements equivalent to those of a full-grown horse, steer, or cow, and are therefore counted as one animal unit. Productive animals are those that contribute directly to the farm receipts. Work horses are not considered among productive animals, because they do not contribute directly to farm receipts. All other animals are considered productive.

FIG 7.—Dairy cows on alfalfa pasture.

out the alfalfa plants. Close cropping also prevents sufficient nourishment reaching the roots to insure strong healthy plants, while, when the ground is wet from irrigation or rains, tramping incident to continuous pasturing tends further toward root starvation by limiting air circulation and interfering with the penetration of moisture.

The more successful dairymen are adopting a system of rotation pasturing (see fig. 8) described by the writer in Circular No. 54, United

FIG. 8.—Rotation pasturing on a dairy farm. On the right an alfalfa crop being harvested by dairy cows—54 head on 20 acres. On the left an alfalfa field from which a crop of alfalfa has just been harvested by dairy cows.

States Department of Agriculture. A concrete example of the operation of the system given in the circular may profitably be referred to again at this point.

A dairy farm of 160 acres all in alfalfa is divided into fields of 20 acres each. Four of these fields are pastured with milch cows during the summer months and the other four are cut for hay. In pasturing, the animals are kept off the fields until the alfalfa is nearly or quite mature enough to cut for hay, and then turned into the fields in sufficient numbers to harvest the crop quickly. From 80 to 90 cows are pastured on a field of 20 acres until the best of the crop has been eaten, and then are turned into another 20-acre field. By varying the time at which cattle are first turned on in the spring, the fields areso managed that crops mature in different fields at different times, thus allowing the cattle to be rotated from one field to another throughout the season. When the best of the crop has been taken by milch cows, they are followed for a few days by dry cows and young dairy stock to clean up such feed as may have been left. Then the field is irrigated and all stock kept off until another crop is ready to be harvested. By discontinuing winter pasturing of hay fields at different dates they are also managed so that crops mature in different fields at different times, and when the hay is harvested it is put up with a hay loader. Dry cows and young stock are allowed to follow the hay loader, thus cleaning up any waste hay. The fields are then watered, and all stock kept off till another crop is ready for harvesting. Dry cows and young stock are fed hay when there is not sufficient pasture for them. At the close of the haying season the fields are seeded [1] to barley, which affords green forage for winter pasture, the fields being rotated as in the summer. Milch cows are allowed free access to hay, and consume considerable quantities of it even when on the best of pasture.

The fields are never pastured when the ground is wet, and a good stand of alfalfa is preserved, the particular farm under consideration having good fields that have not been reseeded during a period of 12 years. Keeping hay before milch cows when on pasture reduces losses from bloat, as does pasturing of only the mature crop. One dairyman with over 100 cows reported that by rotation pasturing and the feeding of hay at all times during the year he had completely eliminated losses from bloat, not having lost a single animal in the last 13 years.

By rotation pasturing the plants are allowed to come to complete maturity, which greatly increases the total yield. Experiments have shown that when alfalfa plants are allowed to come to complete ma-

[1] The barley is seeded in the alfalfa without plowing or disturbing the alfalfa plants in any way. In fact, the harrowing or drilling necessary to cover the barley seed answers for a cultivation of the alfalfa field, loosening up ground that may have become somewhat packed from tramping, thus proving a benefit to the alfalfa.

turity before harvesting the total yield is much greater than when they are clipped off every two or three days.[1] As an example of the results to be obtained by rotation pasturing, it may be stated that one man without purchasing any feed kept on 160 acres of alfalfa 98 dairy cows and enough other live stock to bring the number of his total animal units up to 199. Another pastured 149 mature animals 12 months on 90 acres. Another kept 141 animal units one year on 140 acres of alfalfa, and in addition sold 60 tons of hay and 10,000 pounds of alfalfa seed.

Good dairy stock adds materially to success in dairy farming. The following tabulation, based upon dairy income per dairy animal unit, clearly brings out this fact.

TABLE XII.—*Effect of quality in dairy live stock upon success in dairy farming in the irrigated valleys of southern Arizona.*

Dairy income per dairy animal unit.	Average dairy income per dairy animal unit.	Number of farms.	Average area	Number failing to make 8 per cent.	Dairy products per cow.	Average total receipts.	Average farm income.	Average labor income.	Average price of cows.
			Acres.						
$55 and under	$47	36	72	9	$38	$2,886	$1,709	$357	$90
$55.1 to $65	60	50	92	10	50	3,790	2,405	826	92
$65.1 to $80	72	45	83	5	58	3,855	2,818	1,207	100
$80.1 to $100	89	32	76	4	72	3,290	2,380	1,041	103
Over $100 [a]	124	29	65	3	110	4,802	3,249	1,745	105

[a] Some of the farmers in this group retailed their milk.

The table shows a steady increase in profits accompanying the increase in dairy income per dairy animal unit. The dairy income per dairy animal unit includes the value of all calves and the increases in value of all dairy live stock, as well as the value of dairy products sold. The value of the dairy products sold per cow increases with the income per dairy animal unit. The value of the cows also increases as the amount received for their products increases, showing that the dairymen in Arizona appreciate quality in their dairy animals. It should perhaps be mentioned that in the last group of farms in Table XII a higher efficiency in marketing has added its influence to good quality in the cows, since all the retail dairy farms studied are in this group; but the first four groups of farms are sufficient to bring out forcibly the effect of good quality in dairy stock upon profits in dairy farming.

Several of the leading dairy breeds are found in southern Arizona, but the Holstein breed leads all others in numbers and is represented by several prosperous breeders of pure blood stock. None of these is included in the farms studied, because such farms are regarded as

[1] Lyman J. Briggs and H. L. Shantz. The effect of Frequent Cutting on the Water Requirements of Alfalfa and its Bearing on Pasturage. Bull. No. 228, U. S. Department of Agriculture.

being in a class by themselves and not comparable with ordinary farms. Other dairy breeds are represented by breeders in the valleys, but the numbers of such live stock are far below those of the Holstein breed. Shorthorn cattle, with a preference for the dairy type, rank next in popularity to the Holsteins. These two breeds are preferred because their steer calves develop rapidly on alfalfa forage and purchasers of fat cattle in Arizona make no discrimination against them, contrary to the custom with most dairy breeds. Owners of shorthorn cows are at present breeding them to Holstein bulls, indicating a strong preference in southern Arizona for the black and white dairy cattle. In Salt River Valley, especially, there are a large number of fine graded Holstein dairy live stock, and such cities as Tucson, Bisbee, Douglas, and El Paso are turning to this valley for their supply of dairy cows. Prices of such cattle are no higher in Arizona than in eastern dairy States, and with a little attention to advertising and a little more care in breeding Salt River Valley should soon be known as a home of good dairy live stock and attract buyers from the outside. An outlet would thus be found for young dairy cattle when the present expansion of the dairy enterprise has reached its limits.

The importance of the dairy enterprise in the farm organization may be indicated by classifying all farms studied in the order of increasing percentage of receipts from dairying. Such a classification is presented in Table XIII.

TABLE XIII.—*Effect of increasing percentage of receipts from dairying upon success in farming in the irrigated valleys of southern Arizona 1913 to 1915.*

Percentage receipts from dairying.	Average per cent receipts from dairying.	Number of farms.	Average area.	Number failing to make 8 per cent.	Average total receipts.	Average farm income.	Average labor income.
			Acres.				
0 to 5	1.4	195	141	60	$5,508	$2,768	$618
5.1 to 25	13.2	145	102	45	3,633	2,316	596
25.1 to 45	34.2	94	85	22	3,453	2,182	13
45.1 to 65	54.1	97	79	18	3,423	2,300	45
Over 65	79.6	96	73	16	3,688	2,450	993

Out of receipts totaling $2,913,877, dairy cattle and dairy products contributed $724,740, or 24.9 per cent. The sales of dairy cattle were $266,543 and the purchases $190,240, leaving net sales of $76,303. This indicates large buying and selling locally, and also indicates that when dairying has reached the limit of its possible expansion dairy cattle will have to find an outlet beyond the districts in which they are produced or will have to be sold for beef. The latter alternative will lower prices considerably and make the enterprise less profitable. However, the present large type of dairy cows being produced can easily be sold at from $65 to $75 each for

beef, and unbred heifers will bring as much or more at the age of 3 years when fattened for beef. Prices placed upon dairy live stock were about as follows: High grade heifers ranging in age from 6 months to 1 year, $40; "springer" heifers, $65 to $75; full-grown cows, $80 to $150, the average being about $100, as shown in Table XIII.

The average price paid for butter fat by the creameries was 25.47 cents a pound, and 30 cents was offered where the farmer would agree to deliver his milk or cream sweet. At these prices for butter fat and for dairy live stock, dairying, under conditions similar to those prevailing in 1913, 1914, and 1915, appears to have been the most stable farm enterprise in southern Arizona, as well as one of the most profitable.

The amount of expansion the dairy enterprise will stand and still remain profitable can not be stated definitely. The opinion of three leading creamery men was that the present output of dairy products may be doubled without unfavorable effect on present markets, and that other markets can be developed. The limit in the amount of irrigated land in these valleys will not allow an expansion much greater than this and still retain other profitable enterprises. It appears, then, that success in expansion will depend more upon the market for young dairy heifers after the limits of expansion have been reached than upon new markets for dairy products, unless changes should take place that would limit the present market for these products or lower the price paid for them.

The dairy enterprise has some drawbacks such as losses from bloat, contagious abortion, contagious scours, calf pneumonia, and garget, the latter disease being present in a malignant form, seemingly promoted by the extreme heat of the summer months. It is also difficult to deliver cream sweet without using a considerable amount of ice during the summer months. Contagious scours is being controlled by sanitation, calf pneumonia by vaccination, bloat by rotation pasturing and feeding hay with pasture, and the other diseases will no doubt yield to good sanitary methods and care in breeding.

BEEF CATTLE.

Fattening beef cattle for the market has long been a favorite enterprise on the larger farms in southern Arizona. Contrary to the prevailing custom in the Eastern States, the cattle are not fed grain, but are fattened on green alfalfa forage (see fig. 9) and hay, and the feeding period may vary from 8 to 16 months in length, depending on the size and age of the steers when purchased. The abundance of green forage throughout nearly the entire year, the proximity of the ranges, and the large number of high-grade native steers furnished by the dairymen of the valleys are factors favorable to the

enterprise. Fluctuating prices of both range steers and fat cattle introduce a greater element of speculation than is found in the dairy enterprise, and the capital required is greater; but on the whole the enterprise compares very favorably with dairying. Thirty farmers out of the 627 interviewed for these studies made the fattening of beef cattle a leading enterprise, obtaining on the average 61.5 per cent

FIG. 9.—Fattening steers on alfalfa pasture.

of their total receipts from this source; and 10 others combined the beef-cattle enterprise with some other enterprise in about equal proportions, obtaining over 80 per cent of their total receipts from the two enterprises. Results that were obtained in beef-cattle farming are shown in Table XIV.

TABLE XIV.—*Results obtained in beef cattle farming in the irrigated valleys of southern Arizona, 1913–1915.*

Type of farming and percentage of receipts from principal enterprises.	Number of farms.	Average area.	Number failing to make 8 per cent.	Average receipts.	Average farm income.	Average labor income.
		Acres.				
Beef cattle, 61.5 Crops, 17.6	30	298	6	$11,101	$7,155	$2,146
Beef cattle, 41.7 Grain, 34.2	5	370	1	12,211	5,295	1,505

HOG FARMING.

Six farmers out of 627 made hog raising a major enterprise, obtaining an average of 50.6 per cent of their total receipts from this source. There were only 31 farms upon which hogs furnished as much as 25 per cent of the total receipts. The results of investigations thus far are not favorable to hogs as a major enterprise, both labor income and farm income on hog farms being greatly below the averages for all farms of similar size. The enterprise has been

expanding during recent years, on account of the general tendency of Arizona farmers to substitute live-stock farming for hay and grain farming. The market seems to be quite local in character, and a very marked depreciation in price followed a marked increase in the number of hogs kept on the farms in 1915. Where large quantities of grain are fed to hogs the farm income and labor income are both uniformly low. Poor results are also obtained where large numbers of hogs are kept on the same farm. The best results have thus far been obtained where hogs are kept as a minor enterprise in combination with dairying or grain farming, the hogs getting most of their subsistence on alfalfa pasture and being fattened only a short time on waste grain or skim milk. It is conceded that the quality of pork produced on skim milk is not equal to that produced on barley, but the fact remains that most of the profit is taken out of the hog enterprise when grain constitutes the chief article of feed for any considerable time.

HORSES.

Raising horses for the market is incidental to the keeping of necessary work stock; of 627 farms only 3 were found upon which the marketing of horses assumed a magnitude approaching a major enterprise. These farms are classified as diversified farms, since several other enterprises also found upon them were of equal importance to horses. Growing colts contribute more or less to the receipts upon a large number of the farms, but the amount of such receipts is of minor importance, except in a few cases upon diversified farms.

SHEEP.

Sheep raising in the irrigated valleys of southern Arizona is of minor importance, only 3 farms being found where sheep assumed the magnitude of a major enterprise, and 2 of these combined sheep with some other enterprise. The use of sheep for ditch-cleaning purposes is advantageous, and for this purpose a small flock of sheep may well be kept on nearly every farm, but in general at this time sheep raising on a large scale is not profitable. The 3 farms upon which sheep raising was the chief source of receipts averaged 231 acres in size and obtained from sheep an average of 43.6 per cent of their total receipts. The average results were: Receipts, $7,637; farm income, $3,793; labor income, minus $337. That is to say, the average farm business lacked $337 of paying expenses and interest on investment.

DIVERSIFIED FARMING.

All farms have been classified as diversified upon which the interests of the operator have been about equally distributed among 3 or more enterprises, taking into account receipts, acreage, and capital

invested, and the 3 or more leading enterprises contributing at least 60 per cent of the total receipts. Nearly all of these farms have but 3 leading enterprises. A few have 4 and a very small number have as many as 5. Alfalfa is the basis of their system; the sale of hay contributes more than 15 per cent of the total receipts on 59 out of 109 diversified farms, while pasture and alfalfa seed contribute more than 15 per cent of the receipts on 9 more of the farms in this class. Dairying contributes more than 15 per cent of the total receipts on 62 of the farms, and poultry on 35. The average percentage of receipts contributed by these 3 enterprises on the 109 farms is as follows: Dairying, 22.3 per cent; alfalfa hay, seed, and pasture, 20.5 per cent; poultry, 11.9 per cent. Grain contributes more than 15 per cent of the receipts on 33 farms, hogs on 15 farms, cotton on 16 farms, horses on 14 farms, cantaloupes on 9 farms, fruit on 9 farms, truck on 4 farms, beef cattle on 8 farms, and bees on 7 farms.

Grain contributes an average of 9.9 per cent of the total receipts on the 109 farms, hogs, 7.5 per cent; horses, 5.3 per cent; cotton, 4.5 per cent; beef cattle, 4.3 per cent, and fruit, 4.2 per cent.

Haying occurred combined with poultry and some other enterprise on 22 farms, with dairying and some other enterprise on 24 farms, with beef cattle and some other enterprise on 7 farms and with various other enterprises on 8 farms. Poultry occurred combined with dairying and some other enterprise on 42 farms, and dairying occurred combined with poultry on 42 farms, with hay on 24 farms and with various other enterprises on 5 farms, making out of 109 diversified farms a total of 71 upon which dairying was a prominent enterprise.

The average size of the 109 farms is 88 acres, and the average results obtained were: Receipts, $3,362; farm income, $1,985; labor income, $515. These results are far below those obtained on 178 farms, averaging 83 acres, where dairying was the chief source of receipts, contributing 67.7 per cent of the total. (See Table XI.)

POULTRY.

Records were obtained on 32 farms upon which poultry furnished the greater part of the farm receipts, but since many of the operators were engaged in outside enterprises not connected with the farm, only 21 of the records were used for this study. These 21 farms averaged 27 acres in size and obtained 71.7 per cent of their total receipts from poultry. In addition, two farmers combined poultry with hay and two with fruit, each making poultry dominant over the other enterprise. While poultry is a favorite enterprise on the small farms (see fig. 10) it is by no means confined to them, being a minor enterprise of considerable importance on nearly all farms and frequently assuming considerable magnitude on the larger farms, receipts of over $2,500 from poultry having been found on one farm in each of the groups averaging 80 acres, 100 acres, 160 acres, and 530 acres. It has

already been shown to be one of the three leading enterprises on 42 diversified farms.

Chickens and turkeys are the kinds of poultry almost universally raised, the chickens for the eggs produced and the turkeys for the market. The climate is adapted to egg production and the average production per hen is large, the average value of the eggs produced on 476 farms being $2.03 per hen.

A flock of from 50 to 100 turkeys usually adds a nice sum to the total receipts, and since when allowed to roam the alfalfa fields at will they require little grain to prepare them for the market, their addition to the receipts is nearly all profit. Twenty-one poultry farms averaging 27 acres in size made an average farm income of $1,044. The average labor income was $409.

GRAIN FARMING.

Grain farming (see fig. 11) affords a ready means of rotation for run-down alfalfa fields, and is extensively used for this purpose.

FIG. 10.—A poultry farm of 10 acres—Salt River Valley.

Grain is also grown on newer lands, and by renters on cheaper lands whose owners live elsewhere and hold the lands for speculative purposes. It is a favorite crop on lands that secure most of their water during flood times, as the flood waters are available at seasons more suited to grain culture than any other crop. It is also a favorite crop with the possessors of school lands, who have not wished to make too extensive improvements of their lands until after they learn upon just what terms they are to be allowed to come into permanent possession of them. Because of the cheaper lands upon which the grain crops are grown, involving a lower interest charge against the farm income, grain farms show a relatively higher labor income than would otherwise be the case.

Wheat, barley, and the grain sorghums are the leading grain crops. Oats and corn are of minor importance, though they are included in considering all receipts from grain. Milo maize, feterita, and kafir corn are the favorite grain sorghums.

When the alfalfa fields have ceased to be profitable they are plowed up and seeded to wheat or barley during the fall or winter months. The grain is harvested during the following May or early June. If the field is to be seeded to grain a second time, the land is irrigated and the stubble and volunteer young grain pastured during the remainder of the summer, or the field may be seeded to one of the grain sorghums, the lister being used for this purpose and only one or two cultivations being given to the growing crop. When the second crop of barley or wheat is sown the land is at the same time reseeded to alfalfa. This is the nearest approach to a system of rotation in vogue in Arizona, and it is by no means a general practice.

Opinions differ as to the value of the practice of seeding a grain sorghum crop during the summer upon the fields to be later seeded to

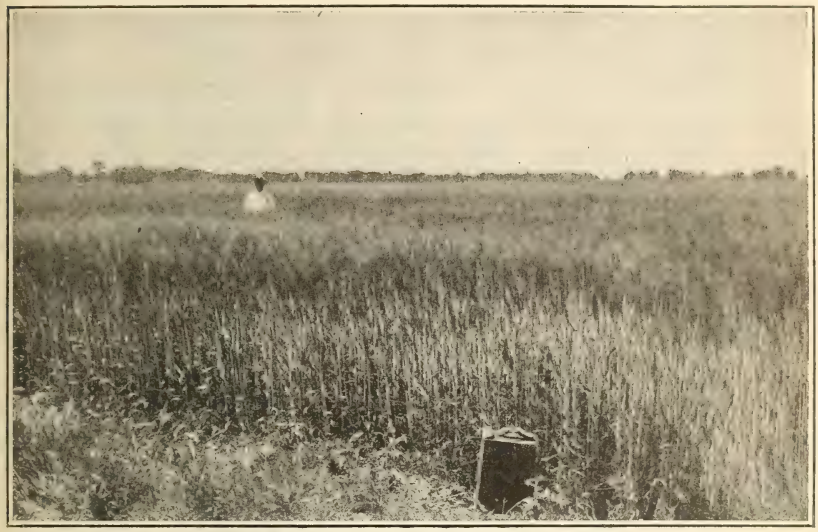

FIG. 11.—A thrifty grain field in Salt River Valley.

wheat or barley. Some claim that the grain sorghum crop injures the land and reduces the yield of the succeeding crop of wheat or barley. Some landlords stipulate in their rental contracts that grain sorghums shall not be seeded during the summer months upon wheat or barley lands. Results obtained by the two systems of cropping are shown in Table XV.

TABLE XV.—*Effect of double cropping on success in grain farming in the irrigated valleys of southern Arizona, 1913–1915.*

System of cropping.	Number of farms.	Average area.	Yield per acre.			Receipts.	Farm income.	Labor income.
			Wheat.	Barley.	Grain sorghums.			
		Acres.	*Pounds.*	*Pounds.*	*Pounds.*			
Double-cropped	18	246	1,667	1,828	2,236	$6,239	$3,097	$839
Not double-cropped	27	159	2,082	1,863	2,034	4,316	2,389	280

The table shows very little in favor of either system over the other. Considering the larger size of the farms the farm income in the group of farms upon which double cropping is practiced is about as much larger than that of the other group as could be expected from the influence of the factor of size alone. The labor income is proportionally larger, but this is due largely to the cheaper lands upon which double cropping was practiced. None of the farmers whose farms are listed in the double-cropped group treated as much as 100 per cent of their grain lands in this manner, and some did not double crop more than 20 per cent of them. For a single season the income from grain farming is much greater when double cropping is practiced than where only a single crop is grown, and there is no evidence that the grain sorghum interferes with the growth of the succeeding alfalfa crop. It appears, then, that when the object of grain farming is primarily for the purpose of rotating an alfalfa field double cropping may be profitably practiced.

Of 627 farms studied, there were 42 upon which the greater portion of the receipts was obtained from grain and 22 upon which grain farming was combined with some other enterprise. The results obtained are shown in Table XVI.

TABLE XVI.—*Results obtained with grain farming in the irrigated valleys of southern Arizona, 1913–1915.*

Type of farming and percentage of receipts from principal enterprises.	Number of farms.	Average area.	Number failing to make 8 per cent.	Average receipts.	Average farm income.	Average labor income.
		Acres.				
Grain, 62.8	42	203	14	$5,187	$2,807	$541
Grain, 36.4 Hay, 43.7	19	97	8	3,212	1,803	143
Grain, 44.8 Poultry, 23.4	2	30	1	1,170	835	249

COTTON FARMING.

Cotton farming is a new enterprise in Arizona, making its first appearance [1] in Salt River Valley in 1912, when several hundred acres were grown. In 1913 the enterprise expanded to over 4,000 acres, and in 1914 it had expanded to 11,501 acres in Salt River Valley and 2,260 acres in Yuma Valley, according to the crop report of the United States Reclamation Service for that year. The low price obtained for the crop of 1914 set the acreage in Salt River Valley back to less than 2,000 in 1915 and almost eliminated the crop from Yuma Valley. The price paid for Egyptian cotton lint averaged about 15 cents a pound in 1914, while in previous years

[1] About 100 acres of cotton were grown at Arlington in 1908 and a gin was built to take care of the crop, but the venture was not a commercial success at this time and so the real beginning of the enterprise was in 1912, since which date more or less cotton has been grown every season.

the price had averaged about 20 cents. In 1915 the price again went back to about 20 cents and in 1916 Egyptian cotton lint sold as high as 70 cents a pound f. o. b. at Phoenix, the most of the crop selling as high as 40 to 45 cents. It is reported that owners of gins offered to contract for the 1917 crop in advance at 27 cents. The area planted to Egyptian cotton in 1917 was over 45,000 acres.

With such variable prices records of the farm business are of little value in establishing the place of Egyptian cotton in any system of organization that might be proposed for the farms in the irrigated valleys of southern Arizona. It may be stated, however, that 28 farms obtaining over 40 per cent of their receipts from Egyptian cotton, the average percentage being 66.9 per cent, produced average yields of 423 pounds of lint per acre, which was sold at an average price of 15.9 cents per pound. The seed brought an average of $14.20 per ton. The farms averaged 88 acres in size and the general results were as follows: Receipts, $4,176; farm income, $1,810; labor income, $541. These results compare favorably with hay farming, but are far below those obtained in dairy farming during the same period of study. When the cotton is valued at 20 cents a pound, however, the results become: Receipts, $4,670; farm income, $2,370; labor income, $1,117. These results compare favorably with those obtained in dairying, while with the price of cotton as high as it was in 1916, even though labor advanced at least 50 per cent, the enterprise was more profitable than dairying, although there was also a considerable increase in the price paid for dairy products. There were 76 records of farms upon which cotton was grown to a greater or less extent, the most of these being taken in 1914 and none after that year, and these were arranged in four groups based upon increasing percentage of receipts from cotton. Both farm income and labor income decreased steadily as the percentage of receipts from cotton increased with the average price of cotton between 15 and 16 cents a pound.

It may be safely stated, therefore, that with yields as high as 400 pounds of lint, and with a price as low as 15 cents a pound, cotton farming is not so profitable as other well-established enterprises, but since the price has been below 20 cents but one year out of the six in which it has been grown in Arizona, the enterprise may be strongly recommended to supplement the live stock interests now so firmly established in these districts, the crop proving admirably adapted for rotation with alfalfa. Picking charges during the period covered by these studies were uniformly 2 cents a pound for seed cotton and ginning charges were $10 a bale. The picking was done almost entirely by Indian labor.[1]

[1] See Farmers' Bulletin 577, "Growing Egyptian Cotton in the Salt River Valley," and Bureau of Plant Industry Bulletin 128, "Egyptian Cotton in Southwestern United States."

FRUIT.

Out of the 627 farms studied 19 were devoted chiefly to fruit raising, obtaining an average of 74.2 per cent of their total receipts from fruit, and the enterprise was prominent on about a dozen diversified farms. The fruit farms are nearly all small, the average size of the 19 studied being 25 acres. The varieties of fruit grown were chiefly peaches, apricots, grapes, and citrus fruits. (See fig. 12.)

Fruit farming pays a relatively high farm income, considering the size of the farms, but the labor income is less satisfactory because of the large interest charge due to the high value placed on developed

FIG. 12.—An orange grove in Salt River Valley.

orchards. The enterprise is somewhat more speculative than such enterprises as dairying or hay farming, and there are a proportionately larger number of fruit growers who fail to make current interest rates on their investment.

A thorough study of the cost of developing orchards and of market facilities will be necessary before any safe predictions can be made regarding the possibilities of expanding this enterprise. Results obtained on the farms studied are as follows: Average receipts, $2,288; farm income, $1,498; labor income, $205. Eight out of the 19 farms failed to pay current interest rates on the investment.

TRUCK FARMING, HOME GARDENING, AND CANTALOUPES.

Truck farming is carried on largely by Chinese and Japanese gardeners, who also import large quantities of vegetables from California and peddle them from house to house both in the towns and in the country. The farms are all small and their number is

not large. Only a few records on such farms were taken. The results obtained on six truck farms averaging 14.5 acres and upon which truck contributed 84.3 per cent of the total receipts were: Average total receipts, $824; farm income, $478; labor income, $110.

Even home gardening is unpopular, gardens being found upon but 22.7 per cent of the farms studied. It is claimed by those who do not have gardens and by many who do that gardening does not pay. Gardens must be irrigated oftener than once per week and after every irrigation they must be cultivated. It is not always convenient to receive the water upon a farm at the time when the garden needs watering, and garden irrigation is therefore neglected. During the summer season the intense heat makes it difficult or impossible for women and children to work in the garden, while larger and more profitable farm enterprises require all the time of man labor. Weeds grow rapidly and all soils but the more sandy ones harden quickly after irrigation, even when cultivated, making an uncongenial home for garden plants. Gardening may be carried on during the winter months, but the number of plants growing during this season is limited, their growth is slow, and they are often injured by frosts. Plant lice multiply rapidly at all seasons of the year and are a constant menace to garden plants. Chinese peddlers import vegetables from California and visit the farmers two or three times a week, extending their routes out as far as 14 miles from the city, and sell vegetables at prices stated by the farmers to be lower than it would cost them to produce them on their farms. Many farmers had kept books on their gardening operations, and these were very positive in their statements that the enterprise does not pay. In the Gila Valley, where the climate is somewhat cooler, gardening could be more successfuly carried on in spring and summer than in either Salt River Valley or Yuma Valley; but here the water runs are more irregular and less certain and therefore gardening is but little more popular than in the other two valleys.

Approximately 2,000 acres of cantaloupes are planted every year in Salt River Valley, but the enterprise is not found to any extent in either of the two other valleys. They are grown almost exclusively on contracts with eastern commission firms, who furnish the seed and send inspectors to the field to superintend cultivation, picking, and packing. The firms contract to advance a stated amount per crate when the cantaloupes are received for shipment, the amount rarely exceeding the cost of production and more frequently not equaling it. The cantaloupes are then shipped and sold on commission, the charge by the firm usually being 15 per cent, the farmer paying all expenses, including freight, icing, cartage, and cost of crates. The returns received by the farmers fluctuate violently, being sometimes high enough to make the enterprise extremely profitable and

at other times so low that the farmers must draw upon the income from other enterprises to pay the freight bills. The enterprise is thus highly speculative, and, unless conditions should change radically, can never become of great importance in southern Arizona.

The relative importance on the farms studied of the enterprises that have been described is shown further in Table XVII, which presents the total receipts on 725 farms arising from each of the various enterprises.

TABLE XVII.—*Distribution of receipts among the various enterprises on 725 irrigated farms in southern Arizona.*

Enterprise.	Value of total receipts.	Enterprise.	Value of total receipts.
Dairying:		Cotton and cotton seed	$146,889
Net sales of dairy cattle over purchases	$76,339	Alfalfa pasture	130,324
Increase in dairy cattle	[a] 273,556	Barley	119,440
Sales of butter and retail milk	76,987	Horses	89,628
Sales of cream	297,858	Grain sorghums	81,081
Total, dairying	724,740	Miscellaneous sources	64,229
Alfalfa hay	458,899	Fruit	60,726
Beef cattle	418,751	Alfalfa seed	53,335
Hogs	180,347	Sheep, goats, wool, and mohair	22,805
Poultry and poultry products	156,951	Cantaloupes	18,279
Wheat	162,446	Truck and watermelons	13,651
		Oats	11,106
		Corn	8,171
		Irish potatoes and beans	3,015

[a] This increase in value of dairy live stock is due to increase in numbers rather than to increase in value of individual animals.

THE ADAPTATION OF THE FARM ENTERPRISES TO THE SIZE OF THE FARM.[1]

In the group of 54 farms of 19 acres or under were 12 dairy farms, 10 poultry farms, 9 fruit farms, and 5 diversified farms. There were 6 farms on which dairying was combined with some other enterprise and 4 upon which poultry was combined with some other enterprise. The remaining 8 farms in the group were devoted to various crop enterprises. Dairy, poultry, and fruit, and their various combinations, give much better results on these farms than other enterprises including diversified farming. The average receipts, farm income, and labor income of the 41 farms devoted to these three enterprises were $1,185, $760, and $313, respectively, while the corresponding figures for the 13 other farms were: Receipts, $700; farm income, $516; labor income, $120.

Among the 45 farms of 20 acres there were 15 dairy farms, 4 poultry farms, 4 farms that combined poultry with dairying, 2 fruit farms, 3 truck farms, 5 hay farms, 2 farms upon which hay and grain were combined, 7 diversified farms, and 3 beginners with enterprises not thoroughly established. The dairy and poultry organization produced average results on the 23 farms as follows: Receipts,

[1] See Table XXI for classification of farms according to size.

$1,702; farm income, $1,161; labor income, $535. The 12 farms devoted chiefly to raising crops, including the fruit and truck farms, produced average results as follows: Receipts, $1,163; farm income, $698; labor income, $195. The corresponding figures for the 7 diversified farms were: Receipts, $1,250, farm income, $698; labor income, $332.

In the group of 54 farms, ranging in size from 21 to 39 acres, 17 farms were devoted chiefly to dairying, 3 to poultry, 2 to grain, 4 to fruit, 8 to hay, 3 to cotton, and 17 to diversified enterprises. Hay farming pays proportionately better in this group of farms than in other groups because of more intensive methods in cultivation, curing, and marketing. The 8 hay farms averaged as follows: Receipts, $1,848; farm income, $1,256; labor income, $469. The 4 fruit farms produced by far the largest returns of any types found in the group, as measured in net farm income, but because of the high valuation placed on the land they failed to pay 8 per cent interest on the investment and therefore produced minus labor incomes. The returns from these farms were as follows: Receipts, $3,191; farm income, $2,447; labor income, $−37. The returns from the 17 dairy farms were: Receipts, $1,795; farm income, $1,327; labor income, $526. Dairying, therefore, is one of the most profitable enterprises found on these farms. Diversified farming in which dairying was the leading enterprise also paid well, the average returns from the 17 diversified farms being: Receipts, $1,691; farm income, $1,249; labor income, $572. The average returns for the 54 farms in the group were: Receipts, $1,874; farm income, $1,317; labor income, $450. A considerable number of the dairy farmers in this group as well as in the two groups of smaller farms retail their milk, but the majority of them patronize the creameries.

On the farms of 40 acres, dairying is the most prominent as well as the most profitable enterprise found. Of 84 farms studied, 34 were devoted almost entirely to dairying, and 9 others were devoted to a combination of dairying with some other enterprise, the two enterprises occupying about equal positions in the farm organization. There were 13 hay farms and 16 diversified farms. Among the remaining 12 farms, 1 was a hay and grain farm, 1 a fruit farm, 2 were grain farms, 3 were cotton farms, 1 produced cantaloupes, 3 produced alfalfa seed, and 1 was pasture. The average returns from the 43 dairy farms were: Receipts, $2,186; farm income, $1,557; labor income, $653. Nearly all the dairy farmers in this group patronized the creameries. The returns from the 25 farms obtaining 82.2 per cent of their receipts from the sale of crops were: Receipts, $1,852; farm income, $1,093; labor income, $181. Thus it is seen that a dairy organization on these farms pays an average of $464 more per year than an organization based upon the sale of crops. The average

returns from the 16 diversified farms upon which live stock contributed 58.6 per cent of the total receipts and crops 39.5 per cent were: Receipts, $1,971; farm income, $1,389; labor income, $489.

Of 103 farms ranging in size from 41 to 79 acres there were 33 dairy farms, 27 of which were devoted almost entirely to dairying and 6 to dairying and 1 other enterprise. In addition to these there were 23 diversified farms upon which dairying was the leading enterprise. There were 21 hay farms and 5 hay and grain farms. The remainder of the farms in the group were devoted to various enterprises as follows: Beef cattle, 3; poultry, 2; alfalfa seed, 4; fruit, 3; cotton, 7; bees, 2.

The 4 alfalfa-seed farms gave remarkably high returns, as follows: Receipts, $4,646; farm income, $2,961; labor income, $1,855. The 2 bee farms likewise gave high returns, but bee farming is a specialized enterprise for which the demand is limited.

Thirty-eight farms with a live stock organization based upon dairying, and upon which live stock contributed 84.2 per cent of the total receipts, gave returns as follows: Receipts, $2,775; farm income, $1,931; labor income, $721. Forty farms with an organization based upon the sale of crops, and upon which crops contributed 81 per cent of the total receipts, gave returns as follows: Receipts, $3,174; farm income, $1,834; labor income, $574. Twenty-three diversified farms, upon which live stock contributed 53.7 per cent of the total receipts and crops 46.3 per cent, produced the following average returns: Receipts, $2,651; farm income, $1,736; labor income, $490.

Also on farms of 80 acres, dairying occupies a prominent place, there being 24 farms out of 75 devoted chiefly to dairying and 4 to dairying and 1 other enterprise. There were 10 hay farms, 8 grain farms, and 15 diversified farms, dairying being the leading enterprise on the diversified farms. The remainder of the farms in the group were devoted to enterprises as follows: Poultry, 2; beef cattle, 1; alfalfa seed, 2; hogs, 1; cotton, 4; pasture, 3; potatoes and grain, 1.

Thirty-two farms with a live-stock organization in which live stock furnished 83.3 per cent of the total receipts produced average returns as follows: Receipts, $3,842; farm income, $2,671; labor income, $1,264. The corresponding figures for 28 farms with an organization based upon the sale of crops and upon which crops furnished 82.8 per cent of the total receipts were: Receipts, $3,155; farm income, $1,820; labor income, $548. The average results obtained on the 15 diversified farms were: Receipts, $2,688; farm income, $1,683; labor income, $427. The live stock organization gave returns averaging $851 better than the crop organization and $988 better than an organization based upon diversified enterprises.

In the group of 47 farms ranging from 81 to 119 acres, dairying was not as prominent as in preceding groups, and about half of the men

engaged in dairying were beginners in the enterprise and had not yet brought it to its highest degree of success. Ten farmers who depended chiefly upon dairying for their receipts were very successful, obtaining returns comparing favorably with returns from this enterprise on the farms of the 80 acres, but five other farmers who attempted to combine dairying with hay, hogs, or grain, were very unsuccessful. One sheep farmer was also very unsuccessful, and two beef cattle farmers were only moderately successful. The live stock organizations upon these farms, therefore, produce average returns relatively much lower than returns from organizations of this kind on the farms of 80 acres. This difference is due to imperfection in the live stock organization itself. The five diversified farms in the group are nearly as successful as the 10 dairy farms, but they obtain an average of 29.4 per cent of their receipts from dairying, this enterprise being in every case much the strongest of the three or more enterprises found on these farms. Results obtained with some of the more successful enterprises were as follows: Ten dairy farms, receipts, $4,124; farm income, $2,855; labor income, $1,089. Five diversified farms, receipts, $4,056; farm income, $2,479; labor income, $931. Two alfalfa seed farms, receipts, $4,412; farm income, $3,024; labor income, $1,297. Two cotton farms, receipts, $5,784; farm income, $2,536; labor income, $927. Twenty farms devoted chiefly to hay, grain, or pasture were comparatively unprofitable, their average returns being: Receipts, $3,015; farm income, $1,713; labor income, $130.

On 39 farms ranging in size from 120 to 159 acres, enterprises were found distributed as follows: Dairying, 11 farms; beef cattle and dairy, 2; alfalfa seed, 1; hay, 6; hay and grain, 1; pasture, 3; cotton, 3; cotton and hogs, 1; grain, 5; diversified, 6. Some of the more satisfactory results obtained were as follows: Eleven dairy farms produced averages of, receipts, $6,275; farm income, $3,821; labor income, $1,602. Six diversified farms, receipts, $6,024; farm income, $4,224; labor income, $1,722. One alfalfa seed farm, receipts, $4,303; farm income, $2,825; labor income, $1,406. One combination hogs and cotton farm,[1] receipts, $11,290; farm income, $6,443; labor income, $4,235.

Thirteen farms with a live stock organization, live stock contributing 83.4 per cent of the total receipts, produced average returns as follows: Receipts, $6,034; farm income, $3,699; labor income, $1,410. The corresponding results obtained on 20 farms organized on the basis of sales of crops, upon which crops contributed 80 per cent of the total receipts, were, receipts, $4,747; farm income, $2,473; labor income, $473.

[1] The farmer in this case was engaged largely in the business of buying hogs, keeping them a short time on his farm, and then selling them, rather than raising the hogs on his own farm.

In the group of 44 farms of exactly 160 acres each, were 17 strictly dairy farms and 3 upon which dairying was combined with hay or grain. The strictly dairy farms were highly successful, producing returns as follows: Receipts, $7,312; farm income, $4,976; labor income, $1,958. The combinations of dairying with hay or grain were comparatively unsuccessful, the three farms producing average returns as follows: Receipts, $5,618; farm income, $2,353; labor income, $343. There were 5 hay farms, 7 grain farms, and 2 farms upon which hay and grain farming were combined. The average results obtained on these 14 farms were: Receipts, $4,748; farm income, $2,426; labor income, $416.

The remaining 10 of the 44 farms in this group were devoted to enterprises as follows: Three hog farms, 2 beef cattle farms, 2 pasture farms, and 3 diversified farms. The 2 beef cattle farms produced results somewhat lower than those obtained on the dairy farms, and the 2 pasture farms produced results somewhat below the average for the whole group. The diversified farms and hog farms were comparatively unsuccessful.

The average results obtained on 25 farms having a live stock organization in which live stock contributed 75.7 per cent of the total receipts were: Receipts, $6,784; farm income, $4,346; labor income, $1,491. The corresponding results on 16 farms with an organization based on the sale of crops, with crops contributing 81.6 per cent of the total receipts, were: Receipts, $4,698; farm income, $2,534; labor income, $486. The live-stock organization shows an average return of $1,812 more per farm than the organization based upon the sale of crops.

On the 50 farms ranging in size from 161 acres to 320 acres dairying is not quite as prominent as on the farms below this size, beef cattle coming into more prominence and largely taking the place of dairying in the live-stock organization. Dairying is not entirely displaced by beef-cattle farming, however, and there are still many successful dairy farms among the larger farms. The enterprises found on these 50 farms were distributed as follows: Dairying, 9 farms; beef cattle, 11; beef cattle and hay or grain, 2; hogs and pasture, 2; sheep and diversified animals, 2; hay, 6; grain, 6; pasture and alfalfa seed, 3, and diversified, 9.

The dairy farms gave the highest returns, the average for the nine farms being: Receipts, $11,102; farm income, $6,606; labor income, $2,567. The six hay farms were unusually successful for this type of farming, the average returns being: Receipts, $9,556; farm income, $5,593; labor income, $1,644.

The farms devoted chiefly to beef cattle were more successful than the average for the group, but did not produce as high returns as the dairy farms. The two farms that tried combining beef cattle with

another enterprise were not so successful, one of them lacking $1,808 of paying current interest rates on the investment and the other making a labor income considerably below the average for the group. Returns for the 11 farms obtaining 67.8 per cent of their receipts from beef cattle were: Receipts, $8,790; farm income, $5,481; labor income, $1,414. The grain and pasture farms were comparatively unsuccessful, as were the diversified farms. Diversified farming in this group and in the group of farms of 160 acres does not pay as well as on the smaller farms, chiefly because the leader of the diversified enterprises has been changed from dairying to hay and grain.

Thirty-two of the farms studied were larger than 320 acres, the average area being 530 acres. The enterprises found on these farms were distributed as follows: Dairy, 2 farms; beef cattle, 9; beef cattle and grain, 4; beef cattle and hogs, 1; hogs and dairy, 1; hay, 4; grain, 7; cotton and grain, 1; diversified, 3. Of these enterprises, dairying and beef cattle proved to be far the most profitable, and where hogs were combined with either dairying or beef cattle the profits were greatly reduced.

The average returns on 17 farms having a live-stock organization, and upon which live stock contributed 80.8 per cent of the total receipts, were: Receipts, $18,163; farm income, $11,019; labor income, $3,318. Corresponding returns on 12 farms having an organization based upon the sale of crops, with crops contributing 81.5 per cent of the total receipts, were: Receipts, $13,720; farm income, $6,718; labor income, $970.

The superiority of a farm organization based on live stock over one based on the sale of crops has been shown in every size group. It has already been shown that as the percentage of receipts from dairying increases both farm income and labor income rise steadily. A classification of all farms on the basis of increasing percentage of receipts from live stock gave similar results; as the percentage of receipts from live stock rises there is a steady increase in both farm income and labor income. A classification of all farms based on increasing amount of working capital per acre also gives similar results. This would be expected, since an increase in working capital per acre usually represents an increase in the number and value of live stock.

THE RELATION OF CAPITAL INVESTED AND SIZE OF FARM TO FARM INCOME AND LABOR INCOME.

The amount of capital required for farming in the irrigated valleys of southern Arizona depends, first, upon the size of the farm to be purchased, and, second, upon the type of farming to be followed. The amount of capital invested has a direct and important bearing upon the standard of living afforded the farm family, and also upon the wages the farmer earns for his labor and supervision. In study-

ing investment and returns upon it there is a distinct advantage gained by dividing the farms into three groups based upon different kinds of tenure, viz: Owned farms, farms partly owned and partly rented, and farms wholly rented. Tables XVIII, XIX, and XX show the relation of the amount of capital invested to the farm income and labor income.

TABLE XVIII.—*Effect of the amount of capital invested upon farm income and labor income on 446 owner farms in the irrigated valleys of southern Arizona.*

Capital invested.	Number of farms.	Average total investment.	Number failing to make 8 per cent.	Average area.	Value of real estate.	Farm income.	Labor income.	Limits of size of farms in group.
				Acres.				*Acres.*
$5,000 and under	32	$3,528	8	13	$2,697	$523	$241	4–40
$5,001 to $8,000	57	6,680	16	26	5,214	833	299	8–80
$8,001 to $12,000	100	9,703	24	40	7,473	1,356	578	10–120
$12,001 to $16,000	63	14,116	14	60	10,956	1,947	818	10–118
$16,001 to $20,000	63	17,719	14	82	14,209	1,995	577	20–200
$20,001 to $30,000	52	24,140	14	106	19,446	2,490	558	40–180
$30,001 to $50,000	45	37,767	12	194	28,854	4,064	1,043	100–440
$50,001 to $167,962	34	82,661	9	395	62,742	8,721	2,108	31–812
All farms	446	20,706	111	95	16,052	2,370	713	4–812

TABLE XIX.—*Effect of the amount of capital invested by tenant on farm income and labor income on 96 tenant farms in the irrigated valleys of southern Arizona.*

Capital invested by tenant.	Number of farms.	Average tenant investment.	Average area.	Number failing to make 8 per cent.	Tenant's farm income.	Tenant's labor income.	Limits of size of farms in group.
			Acres.				*Acres.*
$1,000 and under	11	$582	44	2	$593	$582	6–160
$1,001 to $2,000	31	1,497	66	1	808	749	10–160
$2,001 to $3,000	13	2,536	112	0	1,428	1,222	40–240
$3,001 to $5,000	17	3,823	124	0	1,671	1,366	35–360
$5,001 to $8,000	11	6,712	224	0	2,474	1,637	110–680
Over $8,000	13	10,673	256	0	4,104	3,273	40–800
All farms	96	3,785	124	3	1,677	1,377	6–800

TABLE XX.—*Effect of the amount of capital invested by the operator on farm income and labor income on 85 farms partly owned and partly rented by the operator.*

Capital invested by operator.	Number of farms.	Average operator's investment.	Owned area.	Rented area.	Number failing to make 8 per cent.	Operator's farm income.	Operator's labor income.	Limits of total area farmed in group.
			Acres.	*Acres.*				*Acres.*
$5,000 and under	12	$3,983	12	15	1	$879	$513	8–50
$5,001 to $8,000	16	6,206	21	37	0	1,050	554	15–120
$8,001 to $12,000	16	10,045	38	45	2	1,807	990	30–176
$12,001 to $16,000	12	13,908	47	46	1	1,925	813	40–155
$16,001 to $20,000	12	17,284	60	76	1	2,429	1,045	80–240
Over $20,000	17	38,454	170	149	0	4,683	1,607	36–880
All farms	85	15,692	62	64	5	2,213	948	8–880

These tables all show a steady rise in the farm income and labor income as the amount of capital invested increases, and show that

upon owned farms no satisfactory degree of success is obtained until the investment reaches at least $8,000. Even at this point the labor income is not equal to that paid to Mexican and Indian labor for work on the farms, while the farm income little more than reaches the average living requirements of a farm family. Renters make a much larger labor income than owners, for an equal amount of capital invested, owing to the low rent charged for land as compared with the average mortgage interest rate. The average net returns to the landlords on 210 rented farms were 4.87 per cent of the value of the real estate. Upon these terms renting becomes a more profitable method of increasing capitalization than borrowing money, and men of small means have found it more profitable to rent land than to purchase it. This is due to the fact that working capital earns a much higher interest rate in southern Arizona than money invested in real estate, and by investing in live stock and equipment and renting his land the renter is able to earn much more for his labor, which is his chief asset, than he can earn on the land that he could purchase with the amount of money he has at his command. As shown in Table XX, a considerable number of the owners of the smaller farms increase the size of their business by renting additional land, making a profit by doing so.

The tables show a steady rise in the average size of the farms operated as the amount of capital increases, but as there are wide differences the size limits of farms operated by a given amount of capital the influence of the factor of size of farm can best be studied by classifying the farms into groups having narrower size limits than are obtained by classifying on the basis of capitalization. The study of the distribution of capital on the various farms and the distribution of expenses can also be studied better by classifying into groups based upon size of farm.

In establishing the size of farms in Arizona there has been a strong tendency to divide the section of 640 acres into even fractions, such as halves, quarters, eighths, sixteenths, thirty-seconds, and sixty-fourths, giving rise to a large number of farms of the even sizes of 320, 160, 80, 40, 20, and 10 acres respectively. When it is desired to increase the size of one of these farms it is usually done by adding to it some even division of itself or some other one of these divisions.

In order to preserve these even divisions as much as possible in the study of size, the farms were classified into the following groups: Farms of 19 acres and under; 20 acres; 21 to 39 acres; 40 acres; 41 to 79 acres; 80 acres; 81 to 119 acres; 120 to 159 acres; 160 acres; 161 to 320 acres; and above 320 acres. In determining farm income and labor income for this study all rented farms have been regarded as if owned by the operators, the farm income being determined by sub-

tracting from the total receipts all expenses incurred by both landlord and renter except rent, and the labor income by subtracting from the farm income interest at 8 per cent on the total investment of both landlord and tenant.

The investment required on these farms and the returns obtained from them are shown in Table XXI.

TABLE XXI.—*Investment required on farms of different sizes, and the farm income and labor income obtained by the operators of these farms in the irrigated valleys of southern Arizona.*

Size-group.	Number of farms.	Average area.	Total investment.	Value of real estate.	Per cent of farms failing to make 8 per cent.	Farm income.	Labor income.
Acres.		*Acres.*					
0–19	54	11	$5,417	$4,315	22.2	$698	$4,315
20	45	20	7,205	5,679	42.2	935	354
21–39	54	30	10,845	8,853	25.9	1,317	450
40	84	40	11,119	8,646	26.2	1,387	495
41–79	103	62	15,401	12,381	26.2	1,862	630
80	75	80	16,584	12,898	17.3	2,156	829
81–119	47	101	20,929	17,270	31.9	2,155	480
120–159	39	137	27,050	20,744	17.9	3,141	977
160	44	160	32,158	24,794	27.3	3,590	1,024
161–320	50	244	46,963	36,543	26.0	4,919	1,160
Over 320	32	530	89,470	70,426	21.9	8,934	2,060
All farms	627	104	21,737	17,110	25.7	2,462	722

It will be noticed that the farm income and labor income rise steadily as the size of the farm increases, with the exception of one group, namely, those farms ranging in size from 81 to 119 acres. In searching for the reason why the labor income falls instead of rising in this group it was found that 53.2 per cent of the farmers were engaged extensively in hay farming, grain farming, or in the sale of pasture, while but 38.5 per cent of the farms in the group of next larger farms were so engaged, and in the group of farms of 80 acres but 33.3 per cent were so engaged. But 21.3 per cent of the farmers were engaged in dairying, and many of these were beginners in the enterprise, while in the group of farms next higher in size 26.0 per cent of the farmers were engaged in dairying and 15.4 per cent in highly profitable diversified live stock farming. In the group of farms of 80 acres, 32 per cent of the farmers were engaged in dairying; while in the group of farms of 40 acres, 40.5 per cent of the farmers were engaged in this enterprise. We have seen that during the three years covered by these studies the three dominant enterprises on farms ranging from 81 to 119 acres were among the less profitable in these valleys, while dairying and general live stock were among the more profitable enterprises.

The reason the farmers on farms of this size are not so extensively engaged in dairying is found in economic changes that took place about the time these studies were begun. In former years hay farming had been a comparatively profitable enterprise owing to the

higher prices received, but with the finishing of the extensive work requiring the use of teams, that had been in progress by the United States Reclamation Service for several years, and the opening up of new alfalfa lands, both in these valleys and elsewhere in Arizona and New Mexico, the price of alfalfa hay dropped considerably. The farms were large enough, however, to furnish their owners with a comparatively comfortable living, and they did not respond quickly to this economic change.

The owners of smaller farms have been feeling for several years the necessity for more intensive methods and have been turning to dairying to meet the situation. The raising of live stock has always been attractive to owners of large farms in all sections of the country, and southern Arizona has been no exception. The tendency in this State for the owners of large farms to engage in stock raising has been coincident with the development of irrigation.

The farms ranging in size from 81 to 119 acres are not quite large enough to make the raising of beef cattle attractive to their owners, and are yet large enough to furnish a comparatively comfortable living for the farm family without the dairy enterprise. Their owners have therefore been slow to respond to the changed economic conditions; many of them are still devoting their time to comparatively unprofitable enterprises, and a large percentage of these are on abnormally high priced land.

The owners of many of the smaller farms were obliged to do outside labor to add to the income furnished by the farm. Some outside labor was also done by owners of larger farms, but in such cases the labor was done for the purpose of making more profitable use of equipment purchased for special operations on their own farms, such as leveling land, heading grain, etc., rather than as a necessity to add to the farm income. The number of farmers working out and the amount so earned by them is shown in Table XXII.

TABLE XXII.—*Number of farmers earning money off the farm out of a total of 725 farmers and the amount so earned.*

Size-group.	Number of farms.	Number of farmers working out.	Average earned by farmers working out.	Size-group.	Number of farms.	Number of farmers working out.	Average earned by farmers working out.
Acres.				*Acres.*			
0–19	62	20	$206	81–119	56	8	$554
20	60	19	536	120–159	47	8	450
21–39	68	22	559	160	49	4	559
40	92	21	448	161–320	62	7	495
41–79	111	21	409	Over 320	35	4	826
80	83	9	804				

It will be noticed that the number of farmers doing outside work falls off sharply at the group of farms of 80 acres. This must be

taken to mean that farms of this size and larger fully occupy the time of their operators and give them satisfactory incomes. It should also be stated that in figuring farm incomes and labor incomes used in tables thus far presented none of this outside labor has been included except in so far as it offsets hired labor on the farm, or represents but a few days work with equipment done chiefly to accomodate neighbors not possessing such equipment.

TABLE XXIII.—*Distribution of capital on 627 irrigated farms in southern Arizona.*

DISTRIBUTION OF CAPITAL PER FARM.

Average area.	Dwelling.	Other buildings.	Machinery.	Land.	Cash and feed.	Work stock.	Productive live stock.	Total working capital.	Total real estate.	Total investment.
Acres.										
11	$826	$165	$235	$3,340	$100	$153	$614	$1,102	$4,315	$5,417
20	845	162	267	4,583	133	283	843	1,526	5,679	7,205
30	1,122	160	375	7,573	175	368	1,074	1,992	8,853	10,845
40	877	195	391	7,525	206	439	1,437	2,473	8,646	11,119
62	1,102	283	489	10,970	351	595	1,585	3,020	12,381	15,401
80	952	296	567	11,649	438	584	2,097	3,686	12,898	16,584
101	1,150	316	632	15,677	494	613	1,920	3,659	17,270	20,929
137	1,232	360	849	19,165	847	1,052	3,558	6,306	20,744	27,050
160	1,446	559	993	22,789	1,032	928	4,411	7,364	24,794	32,158
244	1,848	872	1,464	33,661	1,384	1,359	6,213	10,420	36,543	46,963
530	1,500	2,054	1,570	66,889	3,351	2,065	11,058	19,044	70,426	89,470

DISTRIBUTION OF CAPITAL PER ACRE.

11	$75.00	$11.00	$21.00	$304	$9.10	$11.00	$56	$100	$392	$492
20	42.00	8.00	13.00	229	6.60	14.00	42	76	284	360
30	38.00	5.30	12.50	252	5.80	12.40	36	66	295	361
40	22.00	4.90	9.80	188	5.10	14.90	36	62	216	278
62	18.00	4.60	7.90	177	5.70	9.60	26	49	201	250
80	12.00	3.70	7.10	146	5.50	7.30	26	46	161	207
101	11.40	3.10	6.30	155	4.90	6.10	19	36	171	207
137	9.00	2.60	6.20	140	6.20	7.70	26	46	151	197
160	9.00	3.50	6.20	142	6.40	5.85	28	46	155	201
244	7.60	3.60	6.00	138	5.70	5.60	25	43	150	193
530	2.80	3.90	3.00	126	6.30	3.90	21	36	133	169

PER CENT OF TOTAL INVESTMENT.

11	15.2	3.1	4.3	61.7	1.8	2.8	11.3	20.3	79.7	.....
20	11.7	2.3	3.7	63.9	1.8	3.9	11.7	21.2	78.8	.....
30	10.3	1.5	3.5	69.8	1.6	3.4	9.9	18.4	81.8	.....
40	7.9	1.8	3.5	67.7	1.8	3.9	12.9	22.2	77.8	.....
62	7.2	1.7	3.2	71.2	1.3	3.9	10.3	19.6	80.4	.....
80	5.7	1.7	3.4	70.2	2.6	3.5	12.6	22.2	77.8	.....
101	5.5	1.5	3.0	74.9	2.4	2.5	9.2	17.5	82.5	.....
137	4.6	1.3	3.1	70.9	3.1	3.9	13.1	23.3	76.7	.....
160	4.5	1.7	3.1	70.9	3.2	2.9	13.7	22.9	77.1	.....
244	3.9	1.9	3.1	71.7	2.9	2.9	13.2	22.2	77.8	.....
530	1.7	2.2	1.8	74.7	3.7	3.9	12.4	21.3	78.7	.....

The distribution of the capital required on the various farms is shown in Table XXIII. As the size of the farm increases the proportionate investment in buildings and machinery decreases, leaving a larger percentage of the total investment for land and productive live stock, or other working capital. At the same time the owners of the larger farms live in better houses, have larger and better equipment, and own larger and more valuable work stock. The price per acre of the real estate decreases steadily as the size of the farms in-

creases. The amount of cash and supplies required per acre remains nearly constant except on the smaller farms, where it is somewhat larger. The value of the machinery[1] per acre decreases steadily as the size of the farm increases, as does likewise the value of the work stock, indicating a more efficient use of these two items of working capital on the larger farms. The value of productive live stock per acre decreases as the size of the farm increases, indicating more intensive farming on the smaller farms.

The relative intensiveness of the farming on the farms of various sizes is shown in Table XXIV.

TABLE XXIV.—*Relative intensiveness of the farming on farms of different sizes in the irrigated valleys of southern Arizona.*

Average area.	Number of farms.	Receipts per acre.	Expenses per acre.	Farm income per acre.	Labor per acre.	Number of animal units in productive live stock per 100 acres of land.
Acres.					*Days.*	
11	54	$98.20	$34.70	$63.50	31.8	77.6
20	45	70.80	24.00	46.80	16.1	56.4
30	54	62.50	18.60	43.90	11.6	48.5
40	84	51.50	16.40	34.70	10.1	46.3
62	103	46.90	16.90	30.00	8.3	36.0
80	75	42.00	15.00	27.00	6.7	36.6
101	47	35.70	14.40	21.30	6.2	29.1
137	39	40.30	17.40	22.90	5.9	40.6
160	44	37.20	14.80	22.40	5.5	42.3
244	50	34.70	14.50	20.20	4.8	41.9
530	32	30.90	14.00	16.90	3.7	44.6

In studying the table it must be remembered that intensity does not merely mean increased yields per acre, but that it involves the kind and value of crops grown, the kind and number of live stock kept, the system of marketing, and the amount of labor put into the farm business. It will be noticed that as the size of the farm increases the receipts per acre, the net income per acre, the amount of labor per acre, and the amount of productive live stock per 100 acres all decrease. That is, the small farms are managed much more intensively than the large ones. This increased intensity, however, does not usually compensate for the difference in the number of acres farmed, as we have seen in Table XXI, and the larger farms therefore afford better standards of living and pay better wages to the farmer than the small ones. This is due largely to greater efficiency in the management of labor, land, and capital on the larger farms, and to greater efficiency in the use of work stock and equipment. This efficiency is shown in Table XXV.

[1] The value of the machinery reported in the table is about half what it would cost if purchased new, since present values only of all worn or second-hand implements and machinery were asked for in taking the records.

TABLE XXV.—*Relative efficiency in the use of land, workstock, capital, and labor, on irrigated farms of different sizes in southern Arizona.*

Average area.	Work stock per farm.	Value of work stock per head.	Man units in labor including operator.	Value of man labor per acre.	Hired and family labor per acre.	Area farmed per man.	Area farmed per horse.	Capital managed per man unit in labor.	Productive animal units per man.
Acres.	*Head.*					*Acres.*	*Acres.*		
11	1.8	$86	1.2	$58.2	$11.00	9.2	6.2	$4,514	7.1
20	2.8	100	1.1	33.7	7.05	18.2	7.1	6,550	10.1
30	3.4	110	1.2	26.3	6.23	25.0	8.8	9,038	12.2
40	3.8	117	1.4	20.4	6.45	28.6	10.5	7,942	13.2
62	4.9	121	1.7	20.2	9.06	36.5	12.7	9,060	13.1
80	5.0	117	1.8	15.3	7.19	44.4	16.0	9,213	16.3
101	5.3	115	2.1	14.7	8.28	48.1	19.1	9,966	14.0
137	7.8	132	2.7	15.5	9.01	50.7	17.6	10,019	20.6
160	7.7	121	2.9	14.1	8.88	55.2	20.8	11,089	23.3
244	10.7	127	3.9	12.3	7.96	62.6	22.8	12,042	26.2
530	16.3	127	6.5	9.3	6.99	81.5	32.5	13,765	36.4

The number of acres farmed per man and per horse increases steadily as the size of the farm becomes larger. A man unit in labor manages nine times as many acres in the largest-farm group as in the smallest-farm group, three times as much capital, and five times as many productive animal units. One horse works five times as many acres in the largest-farm group as in the smallest-farm group. The work stock is considerably more valuable on the large farms. The number of man units in labor increases with the size of the farm, but the total value of hired and family labor per acre, except in the two extreme groups, remains nearly constant, indicating that the increasing efficiency of man labor with increasing size of farm is due chiefly to increased efficiency of the operator himself and his equipment. This is also indicated by the steady decrease in the total value of man labor per acre as the size of the farm increases.

The rate of interest earned on capital rises with the size of the farm up to 80 acres and then slowly falls, with the exception of the group ranging from 81 to 119 acres, where there is a sharp decline followed by a rise in the group of next larger farms. In calculating this interest rate the contribution of the farm to the family living was added to the farm income, and from the sum the value of the operator's labor[1] was subtracted; the difference was taken as interest earned by capital. Table XXVI shows the relation of size of farm to interest earned on capital invested. While farms of 20 and 30 acres pay a slightly higher interest rate on investment than farms larger than 159 acres, they pay but little more than half as much for the farmer's labor and managerial ability; and if this item were taken at a uniform figure of $600 for all farms the farms larger than 40 acres would pay a higher interest rate than the small farms up to and including 40 acres, with the exception of the group averaging 101 acres and the

[1] The value of the operator's time was obtained by asking him the question: "How much would it cost you to hire a man to do the work that you do and manage the farm as well as you manage it."

group of largest farms, and in these two groups the rate would be very close to that paid by the farms of 40 acres. Farms ranging in size from 40 to 160 acres pay the highest rate of interest.

TABLE XXVI.—*Relation of size of farm to rate of interest earned on capital invested.*

Size group.	Area.	Average total investment.	Farm income plus farm contribution to family living.	Operator's valuation of his labor and managerial ability.	Amount earned on investment.	Rate earned on investment.
Acres.	*Acres.*					*Per cent.*
0 to 19	11	$5,417	$956	$528	$428	7.90
20	20	7,205	1,220	515	705	9.79
21 to 39	30	10,845	1,660	597	1,063	9.80
40	40	11,119	1,688	554	1,134	10.20
41 to 79	62	15,401	2,215	672	1,643	10.02
80	80	16,584	2,461	659	1,802	10.87
81 to 119	101	20,929	2,508	672	1,836	8.77
120 to 159	137	27,050	3,484	771	2,713	10.03
160	160	32,158	3,938	844	3,094	9.62
161 to 320	244	46,963	5,310	1,000	4,310	9.18
Over 320	530	89,470	9,286	1,159	8,127	9.08

There is a definite relation between size of farm and the magnitude of the receipts, expenses, percentage of receipts paid out in expenses, and the percentage of expenses paid for labor. These relations are shown in Table XXVII.

TABLE XXVII.—*Relation of size of farm to receipts, expenses, percentage of receipts paid out in expenses, and per cent of expenses paid for hired labor on irrigated farms in southern Arizona.*

Average area.	Number of farms.	Receipts.	Expenses.	Per cent of receipts paid out in expenses.	Per cent of expenses paid for hired labor.
Acres.					
11	54	$1,080	$382	35.4	24.1
20	45	1,416	481	34.0	28.7
30	54	1,874	557	29.7	27.3
40	84	2,045	658	32.2	29.6
62	103	2,907	1,045	35.9	44.5
80	75	3,357	1,201	35.5	40.5
101	47	3,612	1,457	40.2	44.8
137	39	5,526	2,385	43.1	50.8
160	44	5,951	2,361	39.7	51.0
244	50	8,465	3,546	41.9	51.2
530	32	16,354	7,420	43.7	49.0

There is a common belief in Arizona that the expenses in running a small farm are much less than those incurred in operating a large farm. While this is true abolsutely, it is not in general true relatively. Table XXX shows that the percentage of receipts paid out in expenses does not vary greatly in any of the size groups, and that this percentage is as large on farms smaller than 20 acres as it is on farms of 80 acres. On farms larger than 80 acres the percentage rises slightly, but the rise is not great enough to verify the common opinion. The percentage of expenses paid out for labor is progressively larger on

the larger farms, but the advantage the smaller farms have in labor expense is nearly overcome by proportionately greater expenses for taxes, feed, and water.

The distribution of expense on farms of different size is shown in Table XXVIII.

TABLE XXVIII.—*Distribution of expenses on farms of different sizes in the irrigated valleys of southern Arizona.*

Average size.	Hired labor.	Family labor.	Thrashing and baling.	Repairs on machinery.	Feed purchased.	Taxes.	Water.	Miscellaneous.	Total.
Acres.									
11	$92	$20	$10	6	$140	$38	$18	$58	$382
20	138	21	16	8	116	61	33	88	481
30	152	39	59	9	74	91	47	86	557
40	194	70	77	16	72	95	58	76	658
62	465	115	105	16	63	129	85	67	1,045
80	486	81	123	16	100	148	112	135	1,201
101	652	161	177	21	63	194	126	63	1,457
137	1,212	140	191	40	140	243	190	229	2,385
160	1,203	211	209	44	106	281	210	97	2,361
244	1,814	177	241	63	266	382	295	308	3,546
530	3,636	118	597	148	288	842	668	1,123	7,420

While it has been shown that the smaller farms do not furnish as large a farm income as the larger farms, and do not pay as high wages to the operators, it is yet possible to make incomes of considerable size even on the small farms. This is shown in Table XXIX, which presents the maximum and minimum farm incomes made in each size group, and the percentage of farms in each group making a farm income of $1,500 or more.

TABLE XXIX.—*Maximum and minimum farm incomes made in the different size groups, and the percentage of farms in each group furnishing an income of $1,500 or more.*

Size-group, acres.	Number of farms.	Average area.	Maximum farm income.	Minimum farm income.	Percentage of farms in group furnishing incomes of $1,500 or more.
		Acres.			
0 to 19	54	11	$2,621	$151	5.6
20	45	20	3,359	97	15.6
21 to 39	54	30	3,876	69	29.6
40	84	40	4,711	25	27.4
41 to 79	103	62	5,492	347	62.1
80	75	80	5,323	88	74.7
81 to 119	47	101	4,692	723	80.9
120 to 159	39	137	7,707	834	92.3
160	44	160	9,062	860	90.9
161 to 320	50	244	14,266	385	98.0
Over 320	32	530	24,215	3,386	100.0

Since in all tables hitherto presented the results have been average results of all farms of a class, and therefore have been proportionately influenced by the poorer farms as well as the better ones, and since in all communities there are always a few farmers who fail, no matter what the circumstances may be, it will perhaps add to the

completeness of the data herein presented to make two groups of farms, one consisting of all those farmers who made over 8 per cent interest on their investment, and the other consisting of all farmers failing to make 8 per cent on investment, and present comparative data in the two groups. Such data are presented in Table XXX. In this table the contribution of the farm to the family living was omitted, and the value of the farmer's labor was not deducted in calculating rate of interest.

The table shows that there are 161 farmers out of 627 who with an average of 98 acres each can make only 5.9 per cent on their investment by devoting their whole time to the work, while there are 466 farmers with only 8 acres more land that can make 13 per cent on their investment in the same manner. The average investment in the two groups of farms is almost the same, though the price of the land in the group making the lower profit is $30 per acre greater than in the other group. The more successful farmers make an average of $1,705 more per year than those who are less successful. The average expenses are almost the same, so the difference in farm income in the two groups is due almost entirely to differences in total receipts. The factors affecting total receipts have been discussed quite fully under the various farm enterprises, and need no further discussion here.

TABLE XXX.—*Comparison of farms making a relatively high interest rate on investment with farms making a relatively low interest rate.*

Size group.	Average area.	Number of farms.	Average receipts.	Average farm income.	Average labor income.	Average expense.	Value of land per acre.	Investment per acre.	Working capital per acre.	Investment per farm.	Interest rate.
	Acres.	*Acres.*									*Per ct.*
FARMS PAYING MORE THAN 8 PER CENT ON INVESTMENT.											
0 to 19	11	42	$1,152	$794	$376	$358	$376	$475	$99	$5,225	15.2
20	20	26	1,821	1,341	436	480	267	361	94	7,232	18.5
21 to 39	30	40	1,968	1,415	705	553	228	296	67	8,871	15.9
40	40	62	2,324	1,677	828	647	199	265	66	10,587	15.8
41 to 79	61	76	3,127	2,132	973	995	190	237	47	14,487	14.7
80	80	62	3,658	2,393	1,050	1,265	160	210	50	16,796	14.3
81 to 119	117	32	4,066	2,512	897	1,554	152	188	36	20,181	12.4
120 to 159	138	32	5,838	3,487	1,375	2,351	145	192	47	26,398	13.3
160	160	32	6,656	4,294	1,662	2,362	155	206	51	32,902	13.1
161 to 320	249	37	9,365	5,624	1,919	3,741	141	186	45	46,314	12.1
Above 320	525	25	17,131	10,359	3,069	6,772	135	173	38	91,160	11.4
All farms	106	466	4,480	2,995	1,132	1,485	157	204	47	21,668	13.0
FARMS FAILING TO PAY 8 PER CENT ON INVESTMENT.											
0 to 19	11	12	$823	$361	— $126	$462	$427	$526	$99	$6,090	5.9
20	20	19	862	379	— 195	483	307	358	51	7,168	5.3
21 to 39	30	14	1,608	1,037	— 282	571	480	543	63	16,484	6.3
40	40	22	1,256	571	— 445	685	264	315	51	12,618	4.5
41 to 79	63	27	2,287	1,102	— 336	1,185	236	287	49	17,977	6.1
80	80	13	1,924	1,022	— 224	902	167	195	28	15,577	6.6
81 to 119	100	15	2,641	1,393	— 409	1,248	194	225	28	22,523	6.2
120 to 159	135	7	4,100	1,562	— 840	2,538	180	222	42	30,025	5.2
160	160	12	4,072	1,712	— 677	2,360	156	189	33	30,172	5.7
161 to 320	232	13	5,904	2,912	—1,000	2,992	175	211	36	48,808	6.0
Over 320	547	7	13,581	5,121	—1,539	8,460	124	153	29	83,436	6.1
All farms	98	161	2,796	1,290	— 466	1,506	187	224	37	21,951	5.9

The labor income is affected both by the total receipts and the price of the land, higher priced land calling for a higher interest charge against the farm income, and lessening the labor income to that extent unless the higher priced land produces correspondingly higher receipts. Where the element of speculation is not present the price of land is usually a good measure of its agricultural value, but where speculative values are attached to the land the returns obtained by farming may not be in any way commensurable with the price.

In both groups of farms the average farm income rises with the size of the farm, but in the group failing to make 8 per cent the minus labor income becomes greater as the size of farm advances, since on a losing rate of interest the greater the capital invested the greater will be the loss.

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